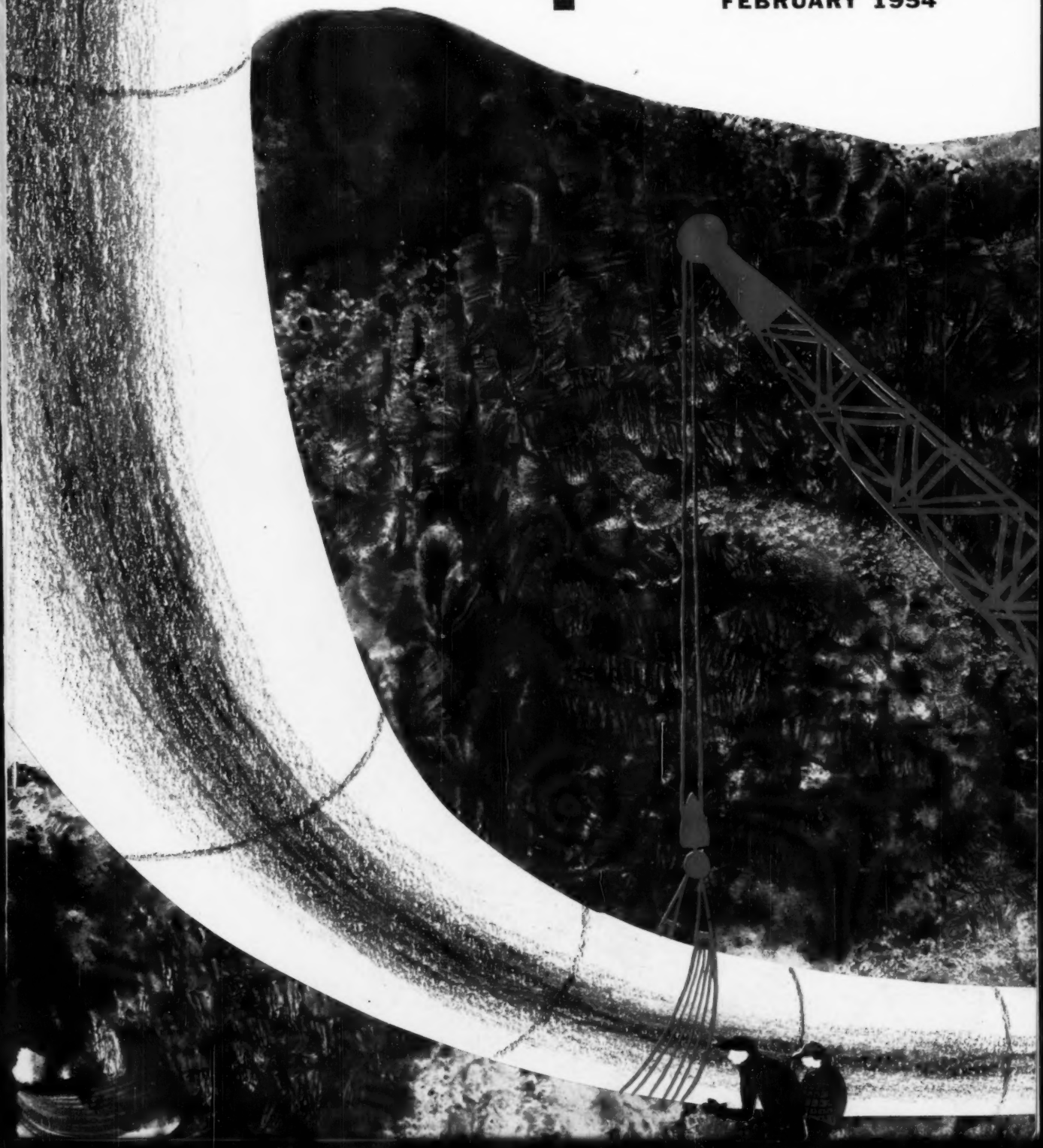
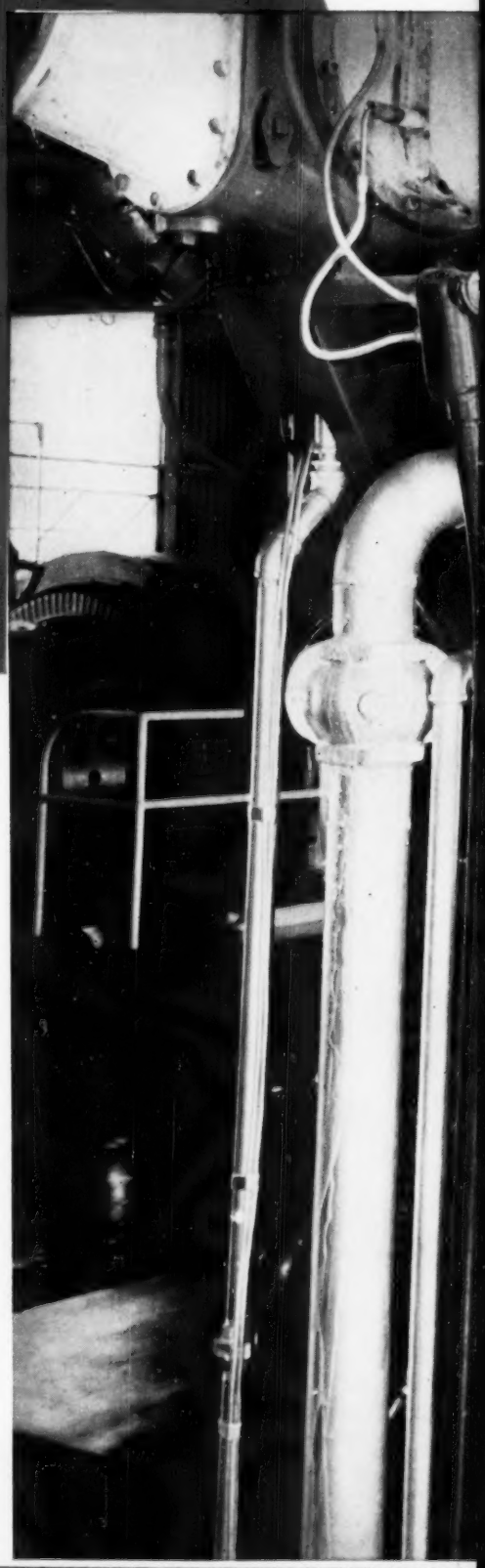
diesel power

FEBRUARY 1954



"CLEANER THAN WE BELIEVED POSSIBLE"



FROM a leading potash producer (name on request) comes this report on diesel performance:

"Texaco has kept our diesels cleaner than we believed possible. Savings on operating and maintenance have been very worth while."

This company uses one of the famous *Texaco Ursa Oil* series — the one that is exactly right for their particular engines and operating conditions.

Approved by leading diesel builders, the *Texaco Ursa Oil* series is a complete line of diesel, gas and dual-fuel engine lubricants especially refined to make engines give *more power* with *less fuel* for *longer periods* between overhauls. That is why —

For more than twenty years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

Whatever the type, size or speed of your engine, or fuel used — there is one of the *Texaco Ursa Oil* series to assure clean, efficient, lower cost operation.

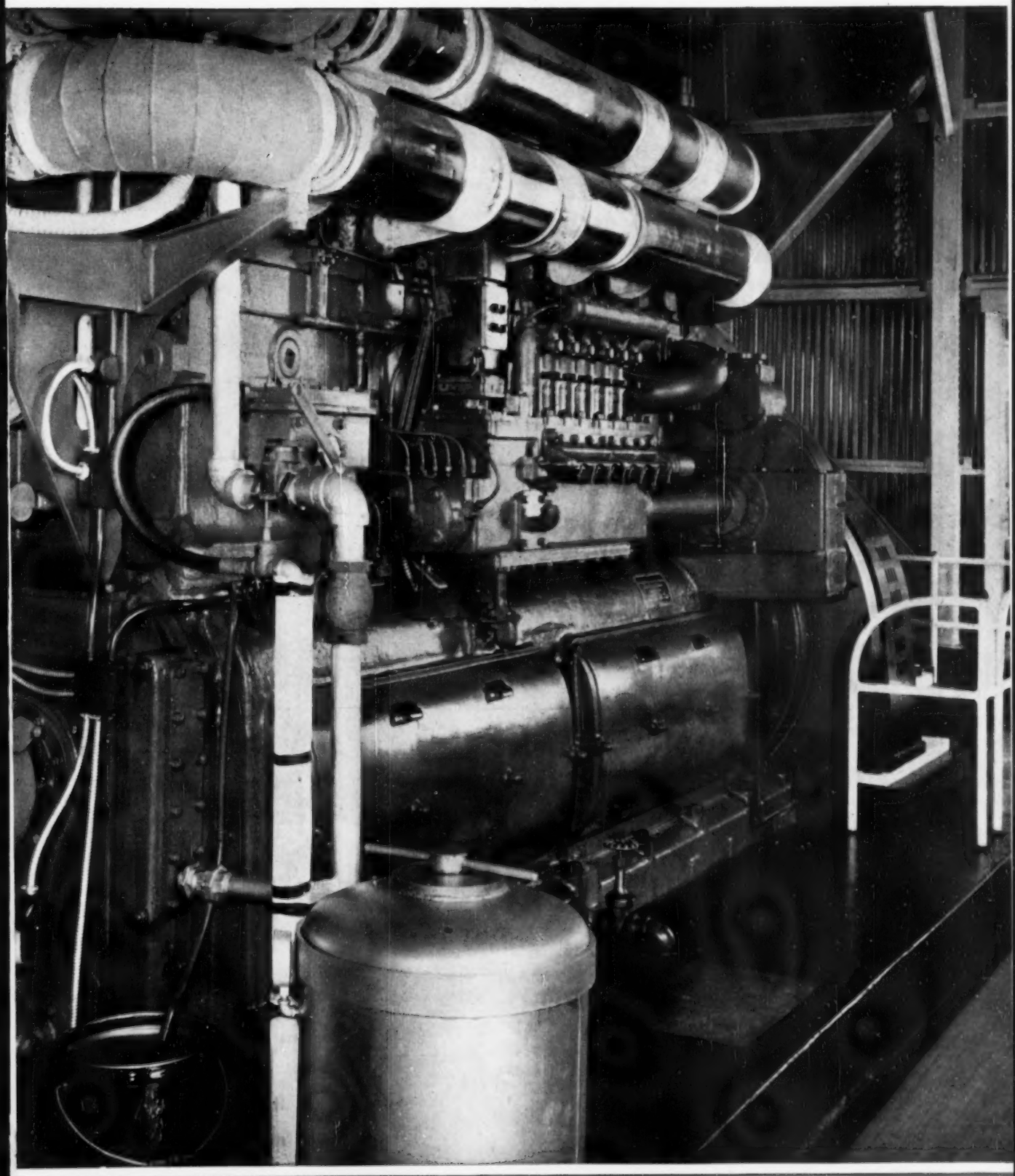
Let a Texaco Lubrication Engineer help step up your engine efficiency. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

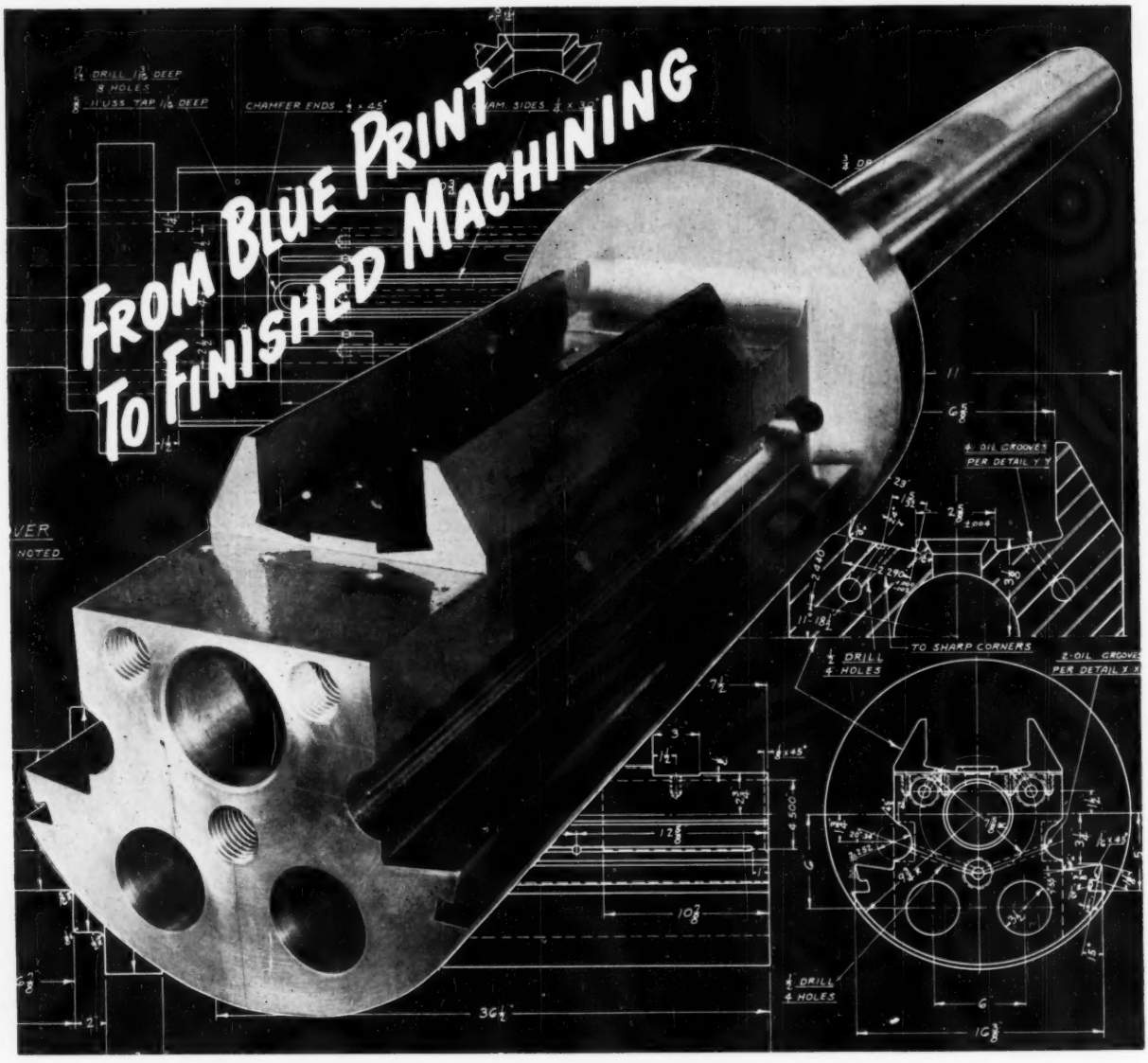
TEXACO

TEXACO



URSA OILS

FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES



This Block Body for a Tension Reel represents the coordinated effort of many National Forge skills in turning out the required electric alloy steel, the proper heat treating and the intricate machining to exacting tolerances.

National Forge offers you complete forging service in one plant—under one responsibility.

Why not take advantage of this "all-in-one" service the next time you need forgings?

For full information, write **NATIONAL FORGE AND ORDNANCE COMPANY,** Irvine, Warren County, Pennsylvania.

Brian P. Emerson
Editor

John H. Wetherell, Jr.
Associate Editor

S. A. Zegar
Assistant Editor

C. W. Kinnear
Railroad Editor

George R. Brighton
President

James E. Jones
Vice President & Treas.

Arnold B. Newell ,
Vice President

Arthur N. Goding
Business Mgr.

Lucille M. Carty
Circulation Mgr.

Frieda L. Hoffenberg
Production Mgr.

Milton J. Wynne
Art Director

M. D. Pugh—Pacific Coast Mgr.
2721 N. Marengo Ave.
Altadena, Calif.

Fred M. Wright Company
South Western Representative
411 No. 10th, St. Louis, Mo.
505 North Erway, Dallas, Texas

Newspaper Representation Ltd.
British Representative
231 Strand,
London, W. C. 2, England

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	9.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER for February, 1954 Vol. XXXII, No. 2. It is published monthly by Diesel Publication, Inc., Kutztown, Pa. Executive and Editorial Offices at 192 Lexington Ave., New York 16, N. Y. Tel. MUrray Hill 3-9874. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1954, Diesel Publications, Inc.

diesel power

Established in 1923 Vol. 32, No. 2 February, 1954

Editorial

Extending the Kit Idea 23

Special Features

Pipelining Across the Canadian Rockies 26

Articles

Cathodic Protection of Storage Tanks 30
Worthington's Automatic Fuel Switcher 33
Get and Protect the Horsepower You Buy 34
Increasing Locomotive Air Filter Efficiency 37
Supercharging to Improve Performance 42
Allison's Torqmatic Brake 45
F-M Model 32 Dual-Fuel Conversion 46
Electrical Equipment Maintenance 48

Departments

Highlights 25
What Do You Know! 36
Straight from the Tool Box 52
News of Our Industry 53
Ad Index 84

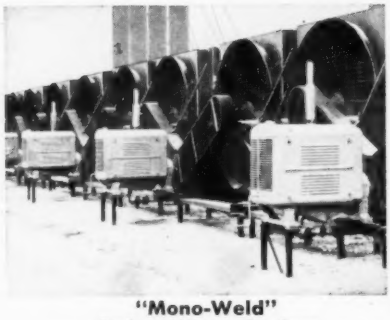
Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

This Month's Cover

An Artist's impression of the almost insurmountable problems faced and solved in the development of the Trans Mountain Pipe Line—the feature story of this issue—depicting diesels at work.

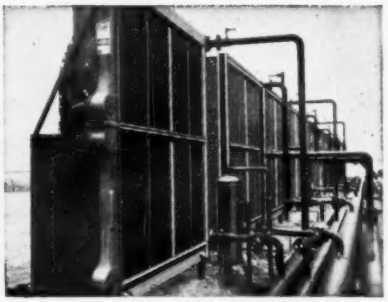
Use Them Individually or in Combination...

YOUNG HEAT TRANSFER PRODUCTS
Are ALL Engineered to Work Together



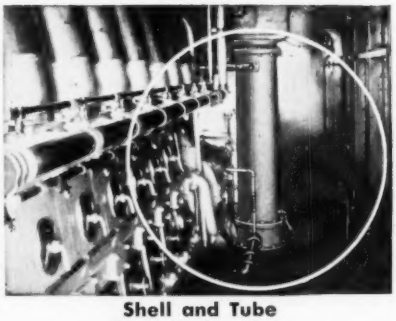
"Mono-Weld"
Jacket Water Coolers

Rugged, welded-steel construction assures maximum strength with minimum weight for stationary or semi-portable equipment. Core sections readily replaceable. Tanks easily removed for cleaning.



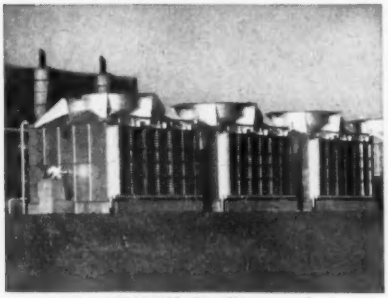
"Full-Flow"
Jacket Water Coolers

Sturdy, welded-steel frame with specially-designed Young "Full-Flow" cast tanks. Flexible mountings absorb vibration, allow for expansion and contraction. Tanks easily removed for cleaning.



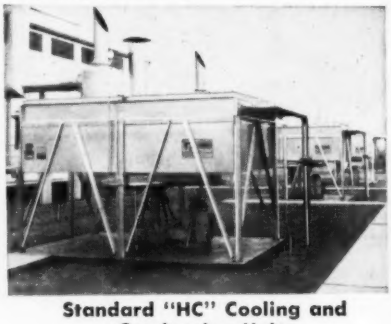
Shell and Tube
Heat Exchangers

Available in 690 standard models, single to four-pass, fixed and removable tube bundles. Unusually close-tolerance construction assures maximum cooling with minimum weight. Calculator available.



"VAD" Cooling and
Condensing Units

Vertical air discharge permits compact multiple unit installations without loss of efficiency due to cross winds. Low-level mounting, low-cost installation, easy inspection and maintenance are features.



Standard "HC" Cooling and
Condensing Units

Horizontal core construction with vertical air discharge. Rugged structural design; wide choice of cores; complete with fans, power plants and controls. In single or multiple type units.

Special "HC" Cooling
and Condensing Units

Specially designed, space-saving units, or extra-large capacity cooling and condensing units can be made to exact specifications. Includes standard equipment; accessories, optional.

YOUNG RADIATOR COMPANY

Dept. 414-B, Racine, Wisconsin
Plants at Racine, Wisconsin and Mattoon, Illinois

YOUNG

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

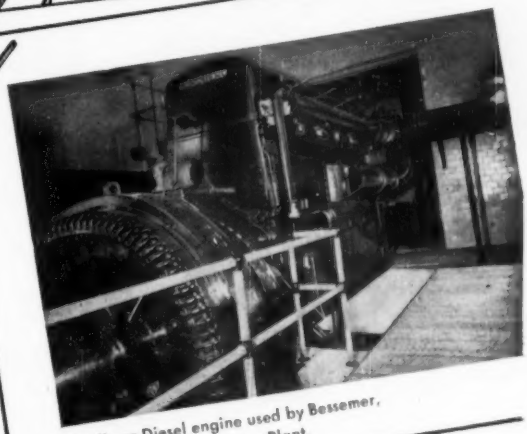
Heating, Cooling, Air Conditioning Products for Home and Industry

Leaders in Heat Transfer Engineering for more than 25 years

For a full picture of the complete Young Line of heat transfer equipment, write for a free copy of General Catalog No. 148. For more detailed information on any of the products shown above, please state which products interest you most, and a complete catalog will be sent without obligation.

*Could you make this report about your diesel engine?**

CITY OF BESSEMER, MICHIGAN REPORTS:



Nordberg Diesel engine used by Bessemer, Michigan Municipal Power Plant.

PISTONS PULLED AT 24,600 HOURS!

- All rings were free
- No carbon in ring grooves
- All original rings replaced in original grooves
- Rings should last at least 10,000 more hours
- Maximum cylinder wear was .004 at top, .002 at bottom

EXCELLENT

OIL CHANGE AT 5000 HOURS!

- No oil added to crankcase between changes
- Power cylinders fed at rate of 5 drops per minute
- Main bearing, rod bearings show very little wear
- Average K.W. per gallon of fuel is 13.5 @ 60% load factor

Sam Kalember

Superintendent,
Bessemer Light Utility.

Note:

FOR TOP ENGINE EFFICIENCY, BESSEMER RELIES ON:

Cities Service DC-930 Oil used for crankcase lubrication!

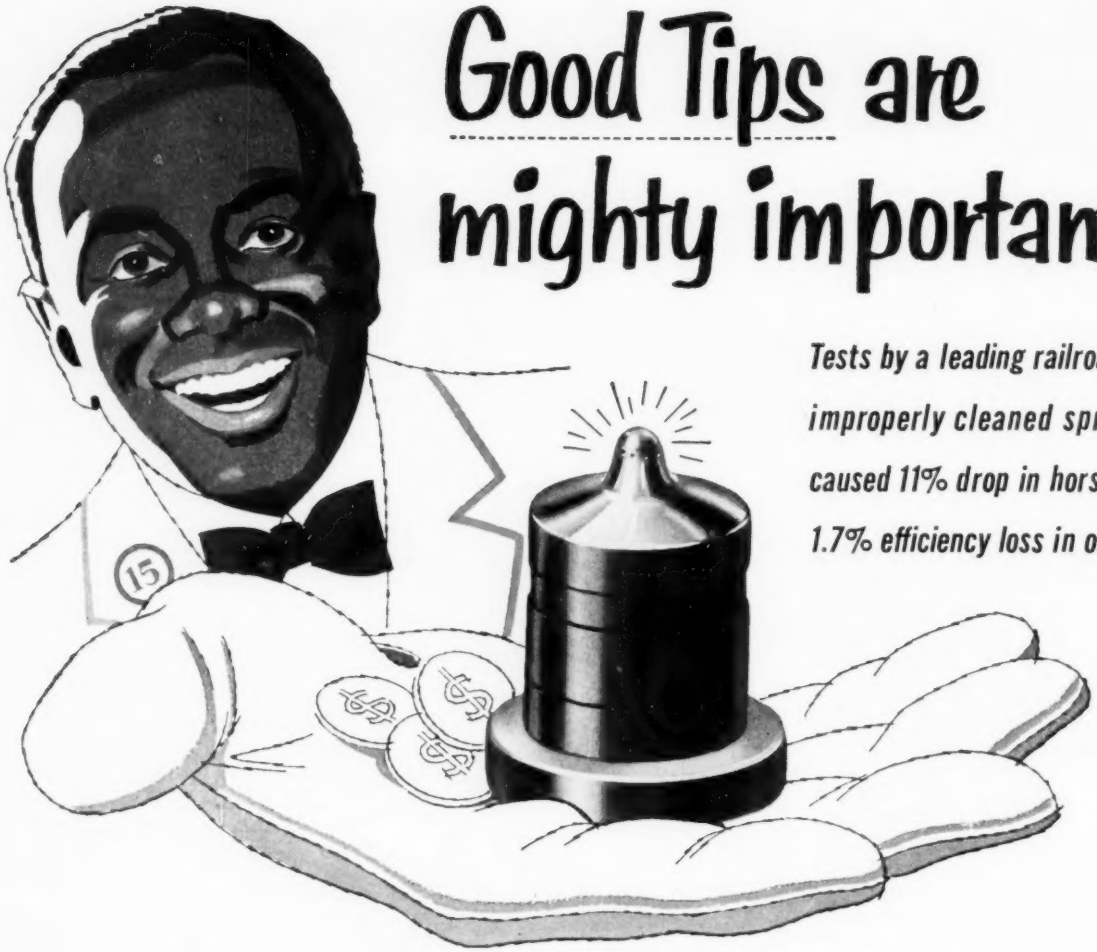
Cities Service DC-230 Oil used for power cylinder lubrication!

* Why not contact your nearest Cities Service Representative or write Cities Service Oil Company, Dept. K7, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Good Tips are mighty important!



Tests by a leading railroad show improperly cleaned spray tips caused 11% drop in horsepower, 1.7% efficiency loss in one year.

Proper maintenance of equipment is a major problem for any railroad, and much time, effort and money are expended to keep power plants functioning at peak efficiency.

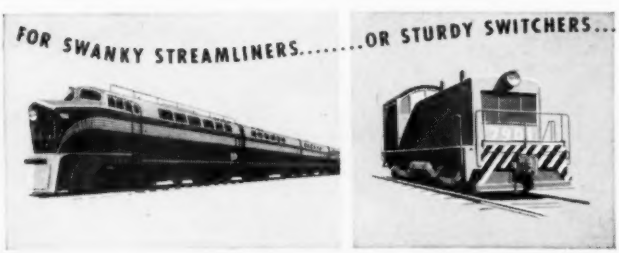
Even the smallest type of equipment such as the spray tips on your fuel injection equipment can cause serious efficiency losses unless properly maintained, as evidenced by recent tests made by one of America's leading railroads.

To assure that operators get full performance out of Bendix Fuel Injection Equipment, we have prepared a special folder showing the best proven method of maintaining the original high polish on spray tips in order to reduce carbon deposits to a minimum.

Send today for your copy of the Bendix bulletin, "How To Clean Spray Tips".

SCINTILLA DIVISION OF Bendix
AVIATION CORPORATION
SIDNEY, NEW YORK

FOR SWANKY STREAMLINERS.....OR STURDY SWITCHERS.....YOU CAN DEPEND ON



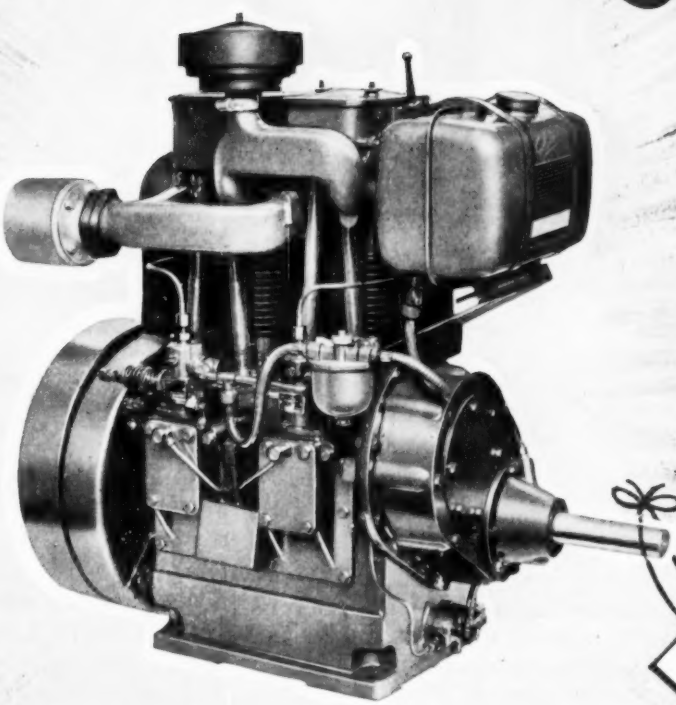
BENDIX*
FUEL INJECTION EQUIPMENT

*REG. U.S. PAT. OFF.

Western Office: 582 Market Street, San Francisco 4, California
Export Sales: Bendix International Division of Bendix Aviation Corporation
205 East 42nd Street, New York 17, N. Y.

Petter Diesel Engines

AIR-COOLED
WATER-COOLED
3 H.P. TO 40 H.P.



LOW COST

BACKED BY A WORLD-WIDE
PARTS AND SERVICE ORGANISATION
FOR THE 350,000 ENGINES IN USE

- MARINE AUXILIARIES
- GENERATORS
- PUMPING EQUIPMENT
- COMPRESSORS
- REFRIGERATION
- OIL FIELD EQUIPMENT
- MINING EQUIPMENT
- AGRICULTURE MACHINERY

WRITE FOR INFORMATION

A FEW CHOICE DISTRIBUTORSHIPS OPEN

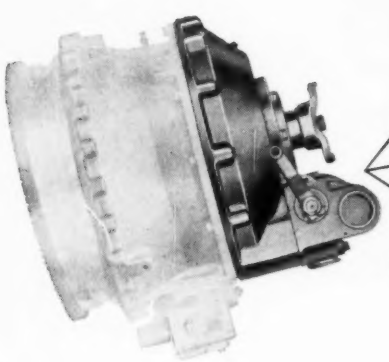
PETTER

ENGINE DIVISION OF BRUSH ABOE INC.

Office and Showroom 60-37 39th AVE. WOODSIDE, NEW YORK

Faster, safer downhill hauling with

New Allison Torqmatic Brake



Speeds job-cycle time—
cuts maintenance costs—no wearing parts
cuts service brake lining wear

ALLISON'S *new* TORQMATIC BRAKE brings faster, safer downhill hauling to heavy-duty trucks. On-the-job tests prove that in many cases drivers can more than *double* present downhill speeds with complete safety. This new dynamic brake speeds job-cycle time for more trips per shift—more pay loads per day.

Proved in Field Tests

This revolutionary new TORQMATIC BRAKE increased round trips 50% per day on year-long tests. Trucks safely came down a 10% grade with a 34-ton load at 12 miles per hour compared to 6 m.p.h. for trucks with friction brakes only. With the TORQMATIC BRAKE, the regular service brake linings lasted from 6 to 8 months —without it they required monthly replacement.

Increased Safety—Better Control

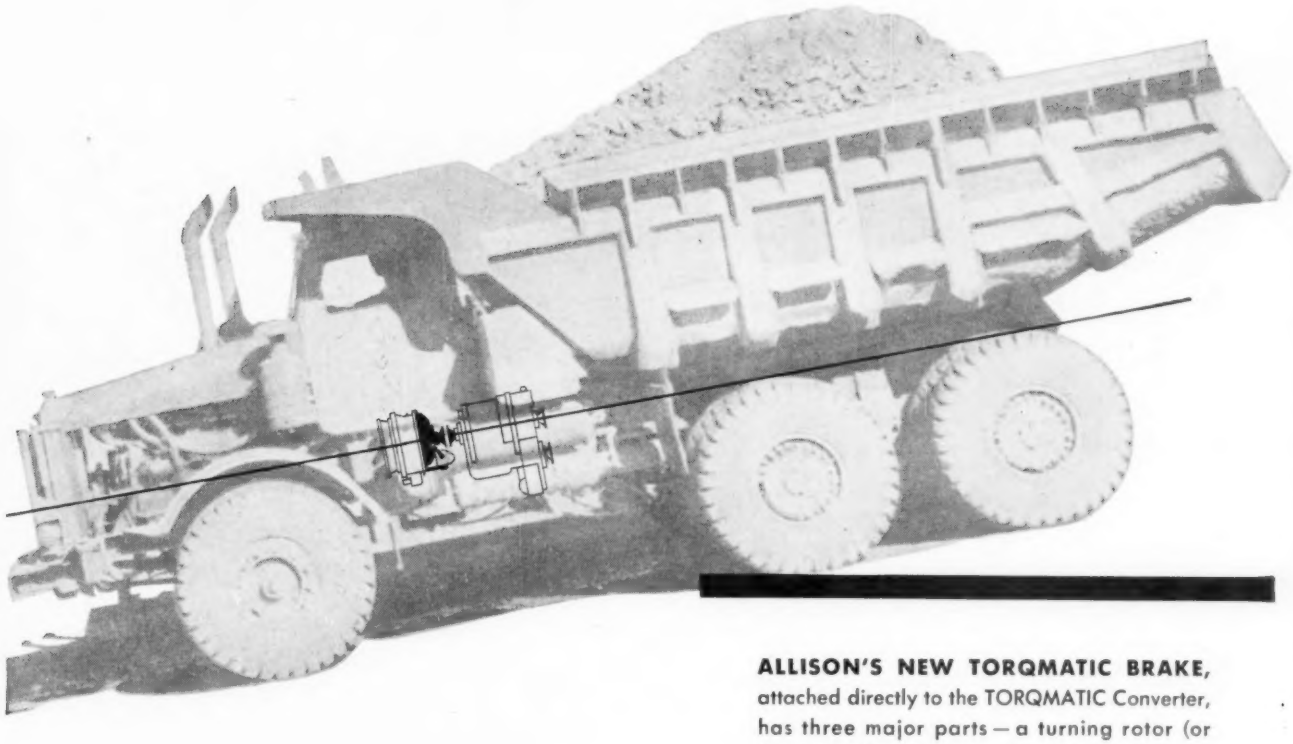
There are no active braking parts to burn up or wear out in the TORQMATIC BRAKE. Drivers have complete control at all times—can brake continuously even going down the steepest grades with the heaviest loads. Trucks never "run away" from the driver. The truck's own rolling force produces the braking power needed, to the limit of the driveline components' strength.

Works on Oil

Oil does all the braking work—absorbs all the braking force. The new TORQMATIC BRAKE takes over from friction brakes on downhill hauls, saves regular service brakes for complete stops or "snubbing" on curves. It's

GM GENERAL MOTORS

Allison



ALLISON'S NEW TORQMATIC BRAKE, attached directly to the TORQMATIC Converter, has three major parts — a turning rotor (or "paddle wheel") attached to the torque converter; non-moving or fixed stator vanes cast into the brake housing; and a control valve.

Here's How it Works: To brake a truck going downhill, the driver pulls the handy control lever to let oil into the brake. The truck's wheels turn the rotor or "paddle wheel" through the truck's transmission. The rotor throws the oil against the stator vanes which resist the oil flow. This makes it harder for the rotor to turn and correspondingly makes it harder for the truck's wheels to turn. The driver gets more braking by letting more oil into the brake. He reduces braking by reducing the amount of oil in the brake. The new brake provides up to 400 h.p. of continuous braking effort.

the *first* downhill braking unit designed and installed as an integral part of the truck's driveline. It bolts directly on the TORQMATIC Converter housing—adds only 4 inches to the converter's length. The brake and converter use the same oil. There are no freezing problems in winter. The TORQMATIC BRAKE can be specified in new trucks equipped with Allison TORQMATIC DRIVES.

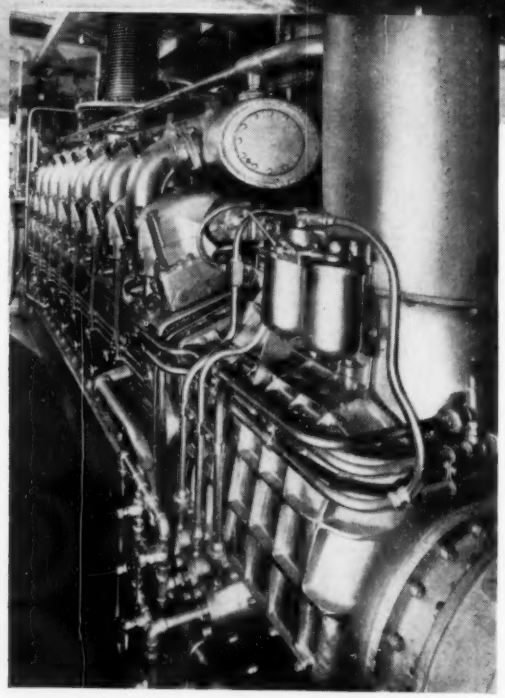
If you're hauling on hilly, mountainous downhill runs, you can cut costs and increase production with Allison's new TORQMATIC BRAKE. For full details, contact your truck manufacturer or write for Bulletin SA 1026 to:

ALLISON DIVISION OF GENERAL MOTORS
Box 894S, Indianapolis 6, Indiana

TORQMATIC BRAKE

NEWEST MEMBER OF THE TORQMATIC DRIVELINE

GULF DIESELMOTIVE OIL



Shown here is the Cordelia, one of two new Diesel tugboats put into service in New York Harbor by the New York, New Haven, and Hartford Railroad. Each is powered by a 16-cylinder, 2-cycle General Motors engine as shown in the inset. Gulf Dieselmotive Oil was selected to lubricate these powerful engines in order to insure dependable and economical operation under the demands of exacting schedules.

The new Diesel tugs will move floats carrying as many as twenty loaded freight cars between New Jersey ports and freight traffic terminals in New York. Despite tides, heavy traffic, storms and ice, the freight cars, many loaded with perishable

selected for New Diesel Tugs

goods, must move on railroad timetables twenty-four hours a day, every day of the year. The tugs are fueled with Gulf Diesel Fuel Oil as well as lubricated with Gulf Dieselmotive Oil.

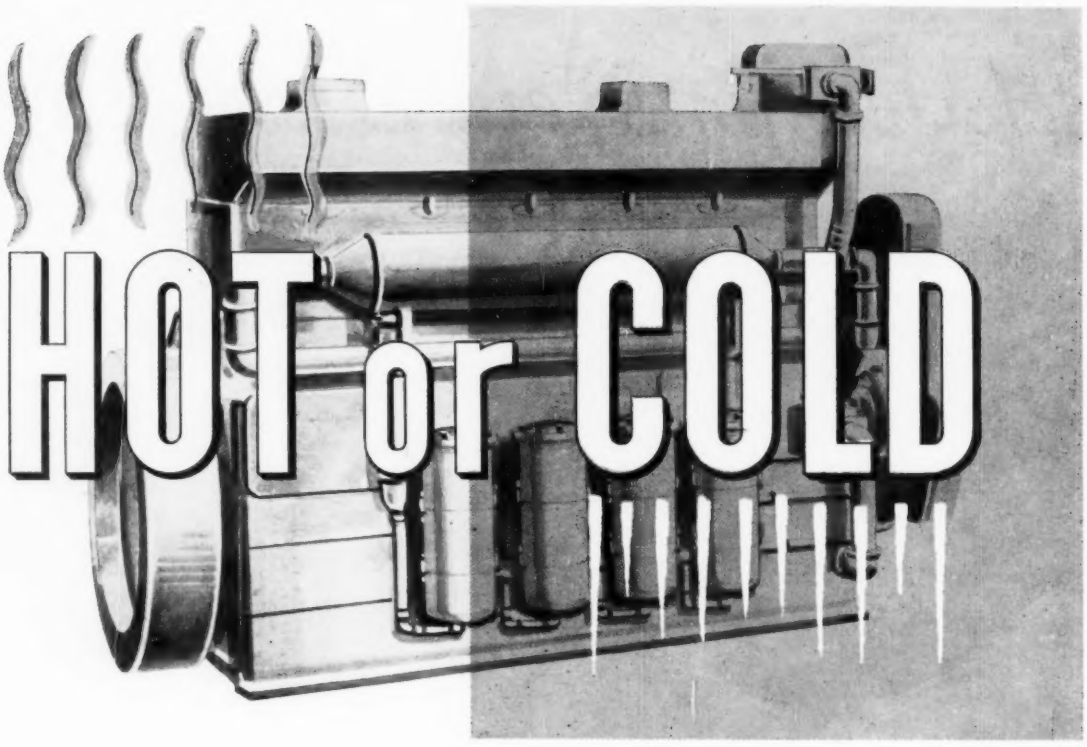
Gulf Dieselmotive Oil ranks very high with marine operators because of outstanding performance, due in part to Gulf's 100% solvent refining of choice base stocks. This superior refining, plus the right combination and right concentration of the right additives, insures cleaner engines—fewer harmful deposits on pistons and rings. You benefit through longer service between overhauls and greater availability of equipment.

Call in a Gulf Sales Engineer and ask him to recommend the proper grade of Gulf Dieselmotive Oil for your operation. A Gulf Sales Engineer is always "on call" at your nearest Gulf office.

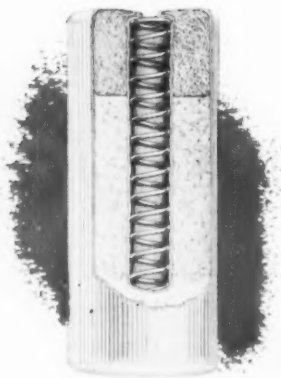
Gulf Oil Corporation · Gulf Refining Company

PITTSBURGH 30, PENNSYLVANIA

GULF



PROTECTED AT ALL TIMES



CP* Controlled Pressure elements are the subject of an interesting and helpful booklet, that can save you money. Write for your copy today — it's free, of course.

You know that engines are completely protected only if the lube oil is filtered under *all* conditions. It is essential that dangerous particles be removed when the oil is cold and viscous, just as it is under normal operating temperatures. When you have less than full-flow filtration, you may not be protecting critical surfaces, if a part fails or if oil is contaminated at the start, because the oil is by-passed around the filter element.

In a Winslow CP* element, cold oil *immediately* flows through the coarser section of filter material, which accepts the oil and removes all critical particles. As the temperature rises, more of the oil flows through the dense section of the element, assuring complete filtration at all times. The proportion of coarse and dense filtering media has been determined by laboratory research and field testing for each size of filter, and is an exclusive design feature of Winslow CP elements.

Winslow filters are your assurance of longer oil life and maximum engine protection under all operating conditions.

WINSLOW FILTERS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

Diesel Locomotives Cut Fuel Costs in Half

Fuel cost per 1,000 gross ton-miles of road freight service performed by Diesel locomotives in 1952 averaged **16.1 cents.**

For coal-burning steam locomotives, it was **31.1 cents.**

For oil-burning steam locomotives, it was **37.1 cents.**

Complete Dieselization will save railroads an additional $249,168,000 a year

—or almost $25,000 a year per Diesel unit

Last year, dieselization saved America's Class I railroads $604,063,000 in *fuel and maintenance costs alone.*

Complete dieselization will increase these savings by $249,168,000 a year—an average of almost $25,000 a year for approximately 10,000 units needed to completely dieselize. This means a national average return on investment of better than 16% for fuel and maintenance savings alone!

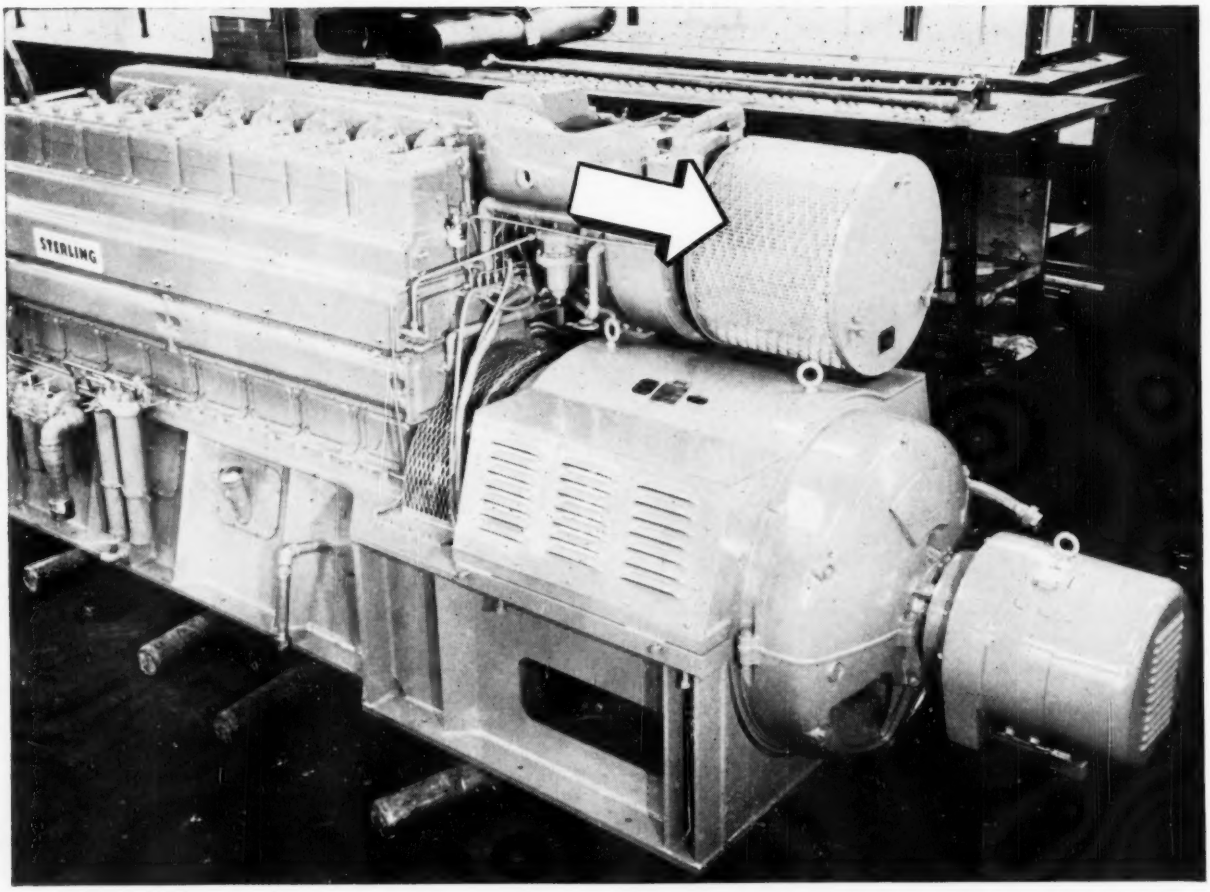
Years of experience prove that dieselization with General Motors locomotives is the soundest investment a railroad can make. For further information, write for booklet, "How Complete Dieselization Pays Off."

ELECTRO-MOTIVE DIVISION·GENERAL MOTORS

GENERAL MOTORS LOCOMOTIVES

LA GRANGE, ILLINOIS • HOME OF THE DIESEL LOCOMOTIVE

IN CANADA: GENERAL MOTORS DIESEL, LTD., LONDON, ONTARIO



Air-Maze filter-silencers cut wear, muffle noise of Sterling diesels used in Navy mobile generating stations

TO MAKE SURE THE U. S. NAVY has an ample supply of electric power wherever it may go, mobile generating stations are equipped with diesels like this 1000 h. p. Sterling VD-8 engine. This station has a net output of 600 kilowatts.

These Sterling turbocharged engines use Air-Maze filter-silencers to solve the double problem of cleaning and quieting intake air. A permanent, cleanable filtering element keeps damaging dust out of the engine's parts, reduces wear, cuts overhaul costs. A specially designed acoustical chamber dampens air intake noise.

Air-Maze filters and filter-silencers are available in a wide range of designs, including oil-bath as well as cylindrical and flat panel types.

For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

The biggest names in diesels are protected by Air-Maze filters

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

FACTS ABOUT

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division

CURRENT PROGRESS

Manufacturing skills support producability of Fairchild J44 turbojet engines for pilotless aircraft.

Ultra-sensitive equipment in modern laboratories aids in the search for new and better materials.

Plant 3, Mineola, N. Y.

This, the newest of three plants engaged in powerplant development and production, symbolizes the *planned* growth of the Fairchild Engine Division . . . and the progressive spirit of an organization that has pioneered in its field for over a quarter of a century.

Within these modern, completely equipped plants – totaling almost one million square feet of floor space – a variety of special-purpose powerplants are being designed and produced for use on land, at sea and in the air. These include the J44 turbojet engine, developed by Fairchild for the Navy and now in volume production for each of our Armed Services, new-type propulsion systems for underwater ordnance, and auxiliary aircraft engines . . . all in addition to a greatly expanding component manufacturing program.

Today, to meet these increased responsibilities, the Fairchild Engine Division is growing bigger . . . to serve America better.

Advanced procedures maintain quality of J47 turbines, phase of large-scale component program.

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division
FARMINGDALE VALLEY STREAM MINEOLA
Long Island, New York

AIRCRAFT DIVISION, Hagerstown, Maryland
ENGINE DIVISION, Farmingdale, N. Y. ● GUIDED MISSILES DIVISION, Wyandanch, N. Y.
*SPEED CONTROL DIVISION, Wickliffe, Ohio ● STRATOS DIVISION, Bay Shore, N. Y.

INTERESTED IN BURNING HEAVY FUEL?

De Laval Oil Purifiers Will Prepare the Oil for Combustion More Adequately than Any Other Means

De Laval Oil Purifiers are the most effective means in existence for preparing residual fuel for burning. These centrifuges remove a maximum amount of incombustible solids from heavy residual fuel.

The De Laval Oil Purifiers operate at constant efficiency. That means that the bowl removes dirt at a constant rate, from the moment it starts until it is completely full of dirt. Dirt is stored outside of the zone where purification takes place . . . the effective working bowl diameter is not decreased during operation.

In one specific instance, a De Laval bowl removed from 13 to 15 pounds of dirt in 5 hours before cleaning was necessary!

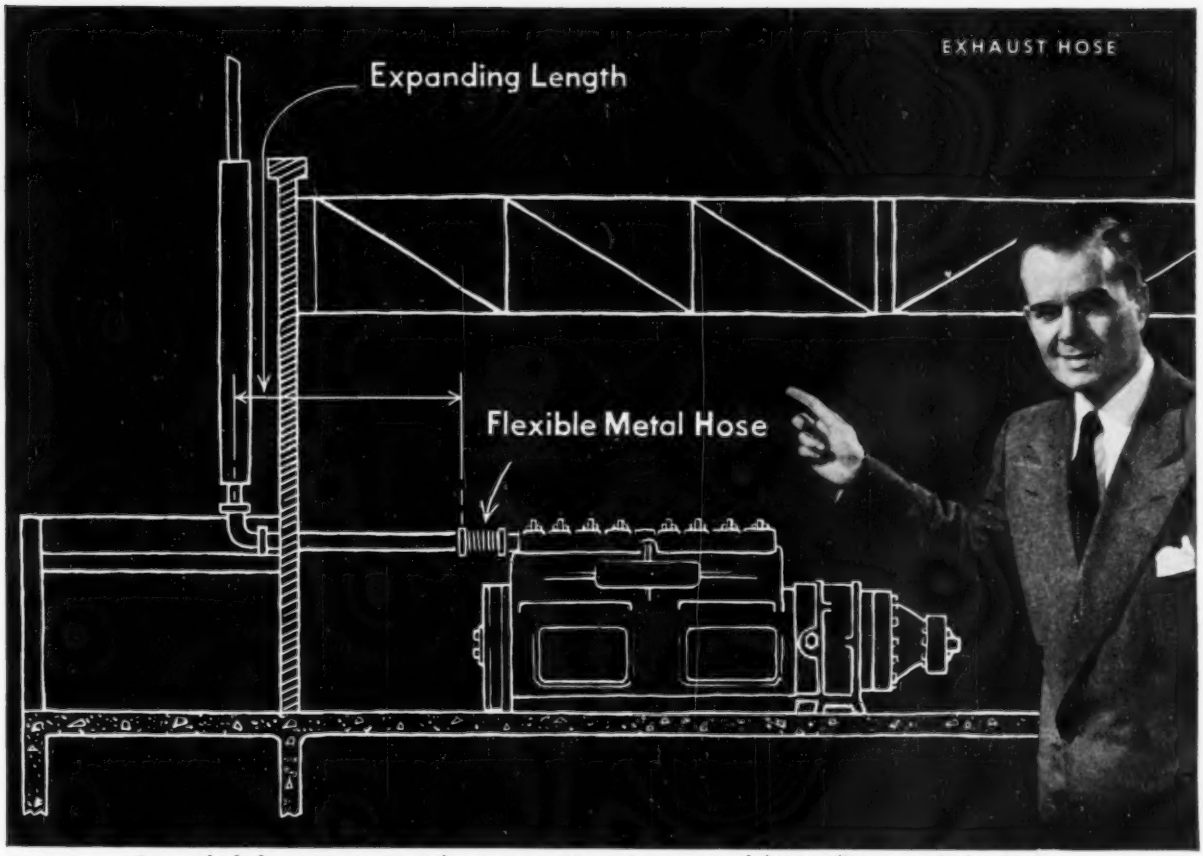
Write for the whole story . . .

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

De Laval

for most dependable power production

FUEL OIL PURIFIERS



One method of arranging engine exhaust piping. Thermal expansion of this installation is calculated below.

EXHAUST-LINE EXPANSION:

Here's how to figure it and how to avoid trouble from it

As an example, let's calculate the thermal expansion of 12 ft. of steel exhaust piping. Room temperature is 80°F; exhaust line temperature, 700°F.

From the table at right, find the elongation rates at 80°F and 700°F. Then subtract room temperature rate from exhaust line rate. Multiply this difference by the number of feet and you have your answer: 0.66 in.

A 0.66 in. expansion such as this sets up problems of physical stress, easily solved by the use of American *Flexible* Steel Exhaust Hose. This sturdy hose takes severe expansion in stride. Self-adjusting, it moves with such disturbances . . . prevents bolts from shearing, engine parts from distorting. Flexible metal hose also absorbs engine and exhaust vibration. It offers an easy solution to problems of offset connections and misalignment . . . cuts installation time and effort.

American Flexible Metal Hose for exhaust and air intake—marine or industrial diesels—is available in corrugated steel, 2 in. to 16 in. I.D. inclusive. For full details, write for Bulletin EH-50-1. *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.* 53228 (Rev.)

OTHER PRODUCTS FOR DIESEL USE – *Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze, carbon and stainless steel. Assemblies complete with fittings.*

Thermal Expansion of Exhaust Pipe in inches per foot

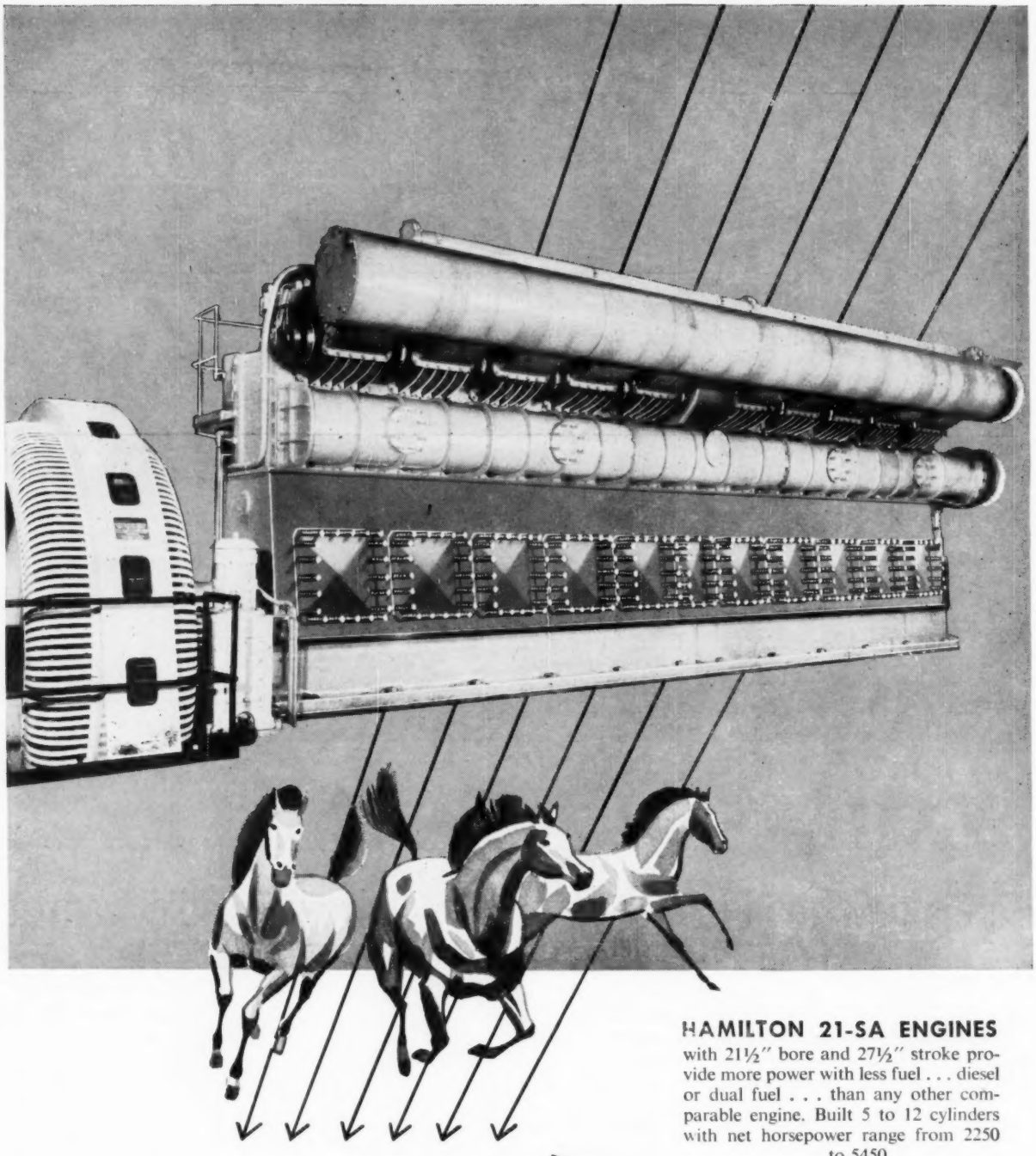
TEMPERATURE DEGREES F.	CARBON STEEL	CAST IRON
0	0	0
40	.0029	.0026
80	.0058	.0052
120	.0091	.0080
300	.0237	.0211
400	.0323	.0288
500	.0415	.0372
600	.0510	.0460
700	.0608	.0550
800	.0711	.0646
900	.0817	.0745
1000	.0928	.0849

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

An ANACONDA® Product



HAMILTON 21-SA ENGINES with 21½" bore and 27½" stroke provide more power with less fuel . . . diesel or dual fuel . . . than any other comparable engine. Built 5 to 12 cylinders with net horsepower range from 2250 to 5450.

Write! This booklet describes fully Hamilton's new design . . . including revolutionary combustion and scavenging system.

HAMILTON DIESELS

give more horsepower per cylinder size and engine speed on either dual fuel or the heaviest Bunker C

HAMILTON DIVISION, HAMILTON, OHIO

BALDWIN • LIMA • HAMILTON

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

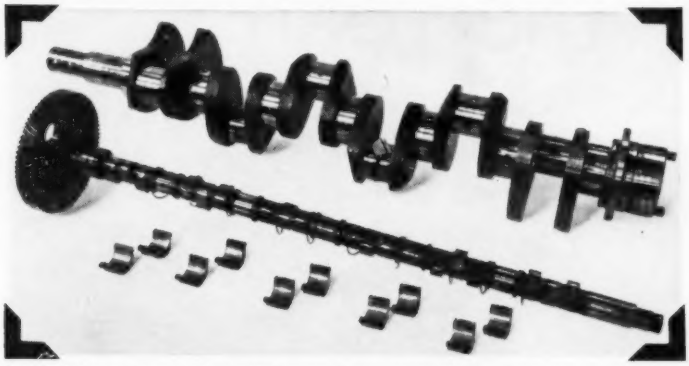
UNIT 6-71 GMC diesel

SERVICE Mainline bus service

PERIOD 1 Year

FIRM Pacific Greyhound Lines, San Francisco

Only 0.003 inch liner wear in 200,275 miles!



LUBRICATED WITH RPM DELO SPECIAL LUBRICATING OIL, these representative parts from a diesel engine of a Pacific Greyhound bus appear just as they did when the engine was torn down after 200,275 miles continuous service. Mileage was accumulated during one year's operation in the variable conditions on the Los Angeles–El Paso, Texas run. Wear on liners miked only 0.003 inch, camshaft 0.0015, and crankshaft journals only 0.0025 out of round. There were no broken rings or other parts.

THE ENGINE WAS EXCEPTIONALLY CLEAN. Note that there were no deposits on the pump screen or in pan. RPM DELO Oils keep contaminants in suspension so they flow out when oil is drained.

FREE BOOKLET on the RPM DELO Oils gives you complete information on how to meet any heavy-duty engine operating condition with one of these oils. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oils reduce wear, corrosion, oxidation in all Heavy-Duty Engines

A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

FAMOUS LAST WORDS:

Let's face it—they won't send out advance warning notices of atom-bomb attacks. They just sneak over and let go when we're least expecting it—without even so much as a declaration of war. The emergency may be an atom bomb or it may be a fire, a flood, a hurricane. It's only good business to be ready for it—whatever it is. Take these precautions TODAY:

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
- ☐ **Promote preparedness** in your community. Your local CD Director can show you how.

Set the standard of preparedness in your plant city—check off these four simple points NOW.

S. Renfrew Bigelow

Publisher

Synchro-Start

OVERSPEED GOVERNORS

For Tachometer Drive Take-off

This Governor can easily be mounted at any location and driven by a standard S. A. E. Heavy Duty Flexible Shaft connected to the tachometer take-off.

It has a single pole double-throw switch enclosed in the cap for either Automatic re-set (Model GFA) or Manual re-set (Model GFM) with contact capacity of 10A at 125V non-inductive load. The rotating parts run in Sealed Ball Bearings lubricated for life and the entire unit is weather-proof.

These Governors can be mounted in any position and have the same characteristics as our Model GKA or GKM which we have been supplying for the past 20 years.

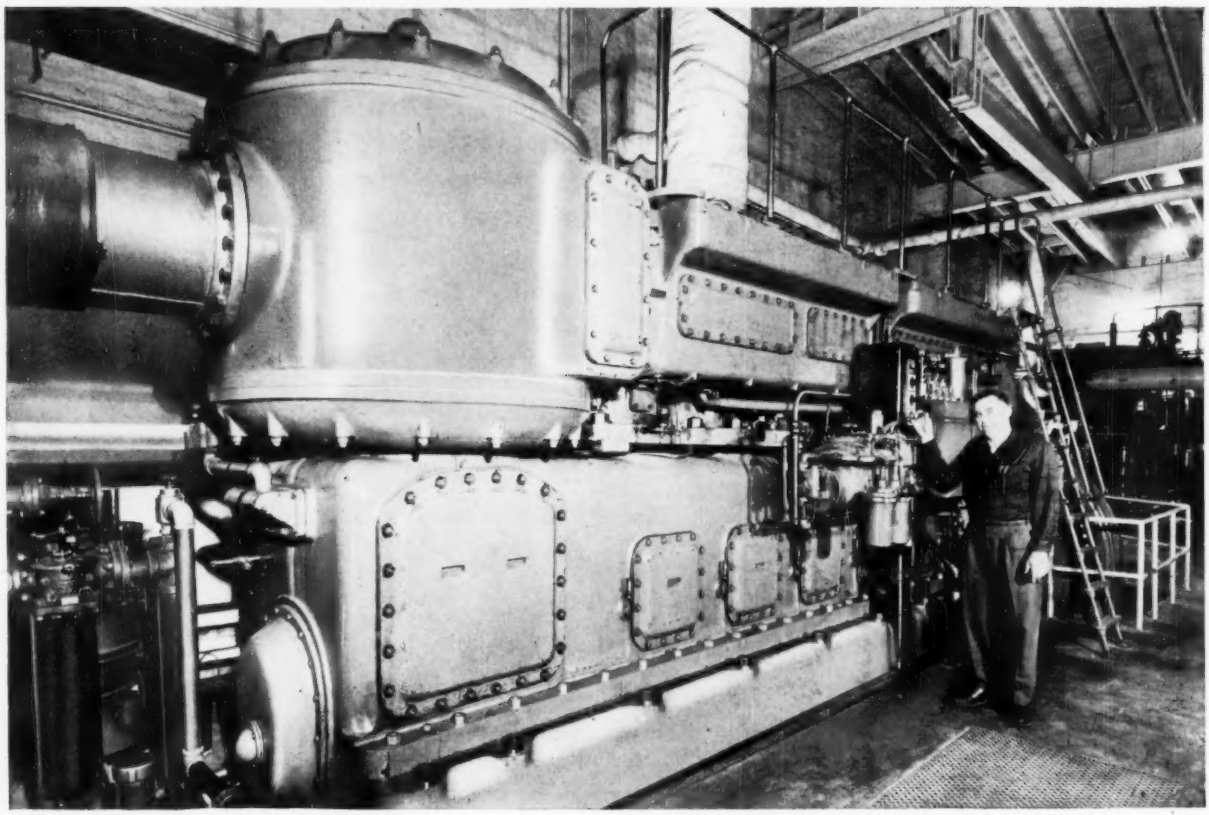
Speed can be adjusted to 20% over or under the ordered shut down speed while the engine is running. Ask for Bulletin 409-A or our catalog #4 describing our full line of Automatic engine control equipment.

SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

8151 N. RIDGEWAY AVE. • SKOKIE, ILL.

"Our tests show Gascon® Oils best!"



. . . says A.E. Harms, CHIEF ENGINEER

YUKON MILL AND GRAIN COMPANY, YUKON, OKLAHOMA

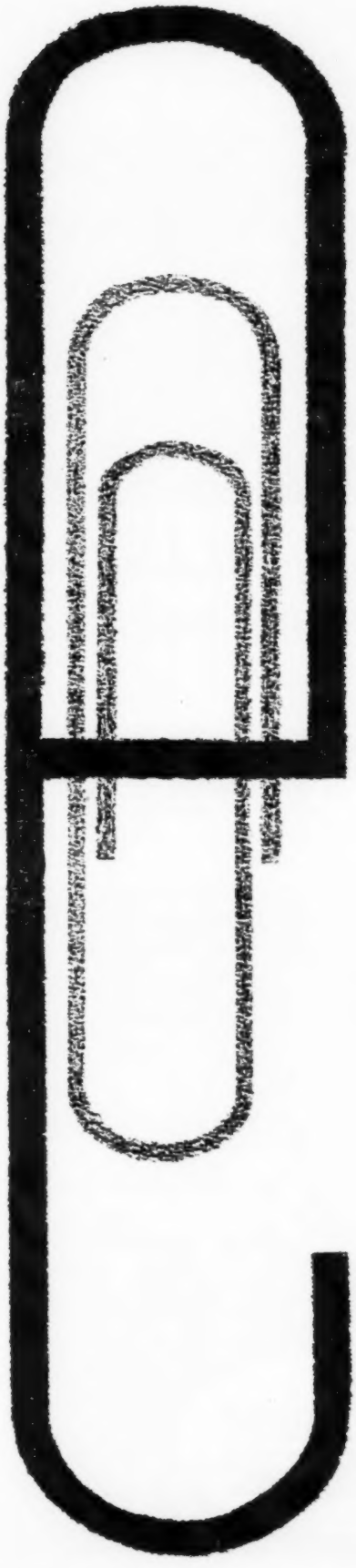
It's *doubly* important that the Yukon Mill and Grain Company's 5 diesels operate with as little trouble as possible. For this plant not only supplies power for the mill, but also for the City of Yukon.

Chief Engineer Harms writes, "When we changed to Sinclair GASCON Oil D-HD, the results were extremely satisfying – wear has been greatly reduced, varnish is gone from pistons and cylinders and stuck rings are a thing of the past. As you might expect, we now use Sinclair exclusively."

You too, can rely on Sinclair's full line of top quality diesel lubricants. Phone your local Sinclair representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save wear and replacements



Extending the Kit Idea

Building a boat? Buy a kit. Want a plastic body on your car? Buy a kit. Building a house? Yes, there're even kits for that. Now, we don't advocate kits to build engines, but there is a good case for modernization, conversion, and repair kits. Some are already available, and the idea has enough merit to warrant development. A catalog from Thew Lorain showed us how far this idea can go. You can order modernization, conversion, and replacement kits by number for their whole line of shovels. You can even get a choice of replacement diesels by specifying a kit number, giving the machine serial number, current engine make, and the make desired. You get the works—no sweating out conversion details. Kits for rebuilding assemblies or sub-assemblies are just as simple. No more

ditorially speaking

poring over parts lists (time and trouble), starting the job with a key part overlooked (inconvenience and more downtime), and no more part-new and part-old units (more labor for more frequent repair). The well-figured parts kit saves money in many ways. The "package" will generally sell for less than the aggregate cost of each part sold individually. Handling and storage is simplified right from the maker to the user's parts bin. There's far less chance for the "overlooked" or "out-of-stock" item to hold up the works; availability will be better. Builders will have less headaches in keeping balanced stocks in the field. Practical component selection is their burden; that's where usage factors will come in. Extension of the kit idea should help everyone—users should save money, engines should run better, and it should sell a lot of parts.

Cyclan withstands considerable distortion without losing shape

No other piston ring material combines so many advantages as

Cyclan

- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

- Mexico recently accepted the first of an order for 15 diesel-electric locomotives from the Montreal Locomotive Works, Ltd.

- According to AAR, more than 2000 locomotives were placed in service during 1953.

- Link-Belt has recently introduced a line of geared flexible couplings designed for high-speed and high-torque application.

- Tennessee Gas Transmission Company has filed an application with the FPC for authority to expand system. Included in the expansion would be 28,000 hp in new compressor units.

- More construction—Five Pacific Northwest power companies have filed application with the FPC for a preliminary permit to construct a hydro-electric project in Idaho.

- According to the API, about 800 ft of wire rope are required in a derrick 100-ft high.

- The American Trucking Association has appointed a committee to study rail-trailer "piggy-back" operation.

- For the first time in history, refinery capacity in the U.S. exceeds 8 million bbl per day, according to API.

- As of January 1, 1954, Class I railroads had 546 diesel-electric locomotive units on order.

- Scientists at the Naval Research Laboratory have developed a paint which changes color with variations in temperature. A series of compounds have been established that will record temperature changes from 50°C to 278°C—*a house of another color.*

- Arkansas Louisiana Gas Company has applied to the FPC for authority to construct 107-mi of pipeline and a new 10,500-hp compressor station.

- Four independent applications for natural gas pipeline projects, recently filed with the FPC, call for the installation of nearly 67,000 hp. American-Louisiana, a newly formed company, was among those filing.

- Incinerators are a must in almost every town. In many such plants which are constantly being erected, diesels supply part of the power and also assure dead plant starting.

- It was recently reported that the first coal-burning, turbine-electric locomotive, which is nearing completion, is expected to be more efficient than conventional steam locomotives. Nothing was said about the diesel.

- In November of 1953, Class I railroads installed 151 new locomotive units. Of this total, 150 units were diesel-powered —one was steam-powered.

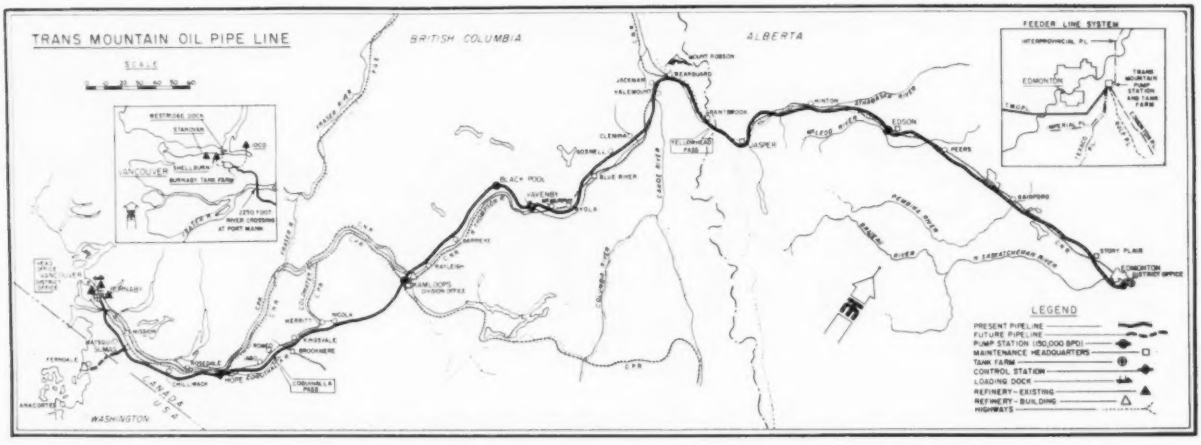
- The Bathurst Power and Paper Company, Bathurst, N. B., recently retired its steam locomotive after 30 years of service. The unit was replaced by a 660-hp diesel. Both locomotives were built by Montreal Locomotive.

- According to the Navy Technical News, four U.S. firms have been selected to build Naval and Air Force bases in Spain.

- The West Virginia Turnpike is scheduled for completion in August 1954. When completed, it will represent the work of approximately 1200 pieces of construction equipment which are now engaged in the task of moving about 30 million cu yd of West Virginia countryside. Mostly diesel-powered equipment, of course.

During the past 30 years, great strides have been made in pipeline construction techniques. A recent achievement in this field was completion of Trans Mountain Pipe Line across the Canadian Rockies.

Pipelining Across the Canadian Rockies



CONCEIVED by far-sighted oil men in a search for new markets, the Trans Mountain Pipe Line went into operation about October 5, 1953. Construction of the line was started in February 1952 and continued until early in December 1952 when extreme weather conditions caused a halt in operations except for work which could be carried on indoors, such as pumping station installations.

When operations ceased, approximately 330 miles of pipe were finished, leaving some 387 miles to be completed when the weather permitted work to be resumed. Despite this shutdown, the line was completed ahead of schedule.

Capacity

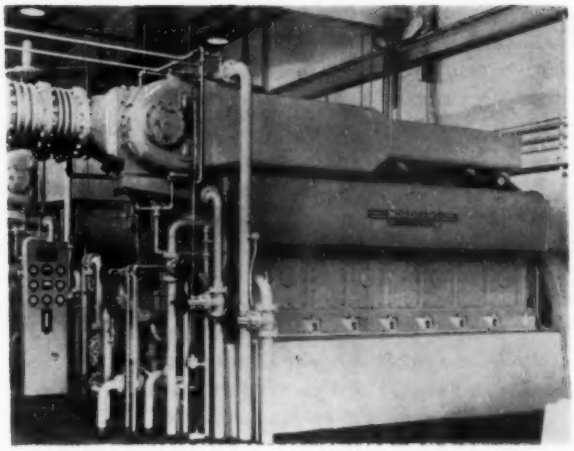
It was originally intended that the line have an initial capacity in the order of 37,500 barrels per day. However, a survey of Alberta oil reserves indicated a need for greater throughput, as did the increasing market. Plans were then changed to include three pumping stations, boosting initial capacity to 120,000 bpd. In December of 1953, a fourth station went into service, raising throughput capacity to 150,000 bpd.

Ultimate capacity for the line is 300,000 bpd with 14 pumping stations. However, with six stations, the present throughput capacity could be increased to 200,000 bpd.

While still in the planning stage, it was estimated that line tariffs would approximate 60 cents per barrel. However, this was based on the initial throughput of 37,500 bpd. With this figure boosted to 150,000 bpd, a trunk-line tariff of 45 cents per barrel was imposed. This figure is exclusive of the marine loading tariff of 2½ cents per barrel at Burnaby. When higher throughputs are attained, the transporting of crudes through the line may become more economical.

Cost of the 4-station, 150,000-bpd line including marine loading dock and the spur line to the interna-

An exterior view of the Edmonton station with air intake filters and exhaust silencers at left of building. One of the 1780-hp Nordberg engines is shown clearly in the picture at the right.



tional boundary was $93 million. Working stock or initial line fill required to put the line in operation was in the order of 2,100,000 barrels, with an additional 600,000 barrels required for storage at both ends. Line fill will be supplied by shippers in keeping with a custom originated by the Spanish.

Route

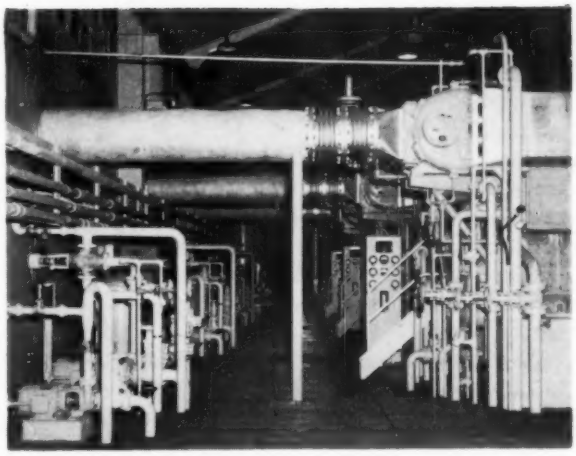
A study of topographical maps covering the area between Edmonton and Vancouver, disclosed four possible routes. Further study narrowed the possibilities to just two. After traveling both routes, the all-Canadian route was chosen over one which would have crossed into northern Idaho and Washington and back into Canada, south of Vancouver.

From Edmonton, an elevation of 2210 ft, the line runs west for 141 miles to the Edson Station, gaining about 850 ft or reaching an elevation of 3060 ft. In the next 75 miles, the line climbs another 860 ft to Jasper Park. At the 251 mile post, the line crosses through Yellowhead Pass at an elevation of 3720 ft. In the miles following, elevation gradually decreases on the western slope of the Rockies to 3460 ft at Mile 297; 2960 ft at Mile 326; and 1540 ft at Mile 440 where the Black Pool Station is located. From Black Pool Station, the line rises the approximately 2300 ft and then drops to the Thompson River, crossing at an elevation of 1120 ft. In the following two miles, the line climbs 1360 ft to the Kamloops Station, starting the crossing of the coastal range.

From the Kamloops Station, the line continues to ascend to the Kamloops Plateau, an elevation of 3980 ft, a climb of 1500 ft in 10 miles. Before reaching Coquihalla Pass, which lies about 78 miles from Kamloops Plateau, the line drops to an elevation of about 1960 ft and then climbs to the pass which is an elevation of 3760 ft.

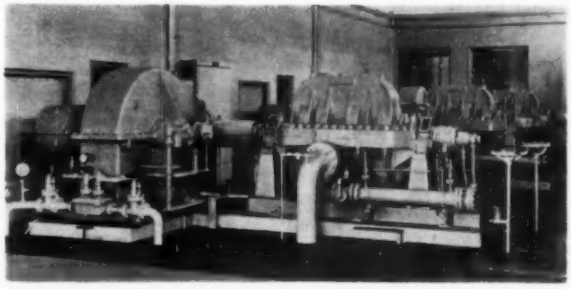
Now over the coastal range, the line drops almost steadily for the next 28 miles to an elevation of 120 ft at Hope, then gently slopes to the 2250-ft wide Fraser River crossing at sea level. Once across the Fraser River, the line climbs to Burnaby, an elevation of 500 ft.

For the most part, the route follows the Canadian Na-



From the turbocharger end, the control cubicles and other auxiliary equipment can be seen. Lube oil filters are at left of photo along with pumps.

Below is the pump room of the Edmonton station showing the speed increasers and pumps which are isolated from the engine room by a wall.



tional Railroad to Kamloops, then goes across country to Merritt where it meets the Canadian Pacific Railroad. The remaining portion of the line generally follows the route taken by the Canadian Pacific into Vancouver.

Main Facilities

In addition to the 718 miles of 24-in pipeline from East Edmonton to Burnaby, which includes 2½ miles of 24-in line to the company's marine loading dock on Vancouver Harbor, there is a 5½-mi, 24-in spur line to the International Boundary. This spur line will be extended in 1954 to Ferndale, Washington, a distance of 26½ miles and will supply oil to a refinery now being constructed at that point.

Located approximately six miles east of Edmonton, situated on a 160-acre tract, are the receiving tank farm and the Edmonton pumping station. Receiving tank farm facilities include sufficient steel tankage to accommodate 1,520,000 barrels of crude. Tankage consists of eight 150,000 bbl and four 80,000 bbl cone-roof tanks. Suction booster pumps are also provided in the line before the pumping station.

The delivery tank farm at Burnaby is on a 190-acre tract and contains 1,220,000 bbl of steel tankage, including six 150,000 bbl and four 80,000 bbl floating-roof tanks. At both the receiving and delivery tank farms, a common header serves as both a fill and suction line. In other words, one line is connected to each tank from the header and by a suitable valving arrangement, a tank may be either filled or emptied from the common header.

At Burnaby, the delivery tanks are set on a hill 495 to 575 ft above sea level, thus effecting gravity delivery of crude to the marine loading dock and nearby refineries. To control the velocity of crude being loaded for off-short transport at Burnaby, a friction-tube device consisting of a number of smaller pipes has been inserted in the larger pipe. The arrangement provides delivery rates which range from 2000 to 20,000 bbl per hr. In actual operation, the smaller pipes are choked off by compressed air jets to regulate flow. Electronic remote-reading gauges are also provided for tanks at all terminals and stations on the line.

Shore facilities at Westridge on Burrard Inlet, Vancouver Harbor, the point at which the tanker and barge loading is located, consist of two 10,000-bbl steel tanks for changing oil types in the delivery line, and a 50,000-bbl steel tank and concrete skimming sump for tanker ballast water.

Pumping Stations

At present, there are four pumping stations in operation. Each station is powered by three Nordberg "Supairthermal" engines, bringing the total number of engines to 12, a combined horsepower rating of 20,010.

The engines at Edmonton, Kamloops, and Black Pool are all 8-cyl units with a bore and stroke of 13 by 16½ in, rated 1760 hp at 500 rpm. These units are connected to 5-stage, 8 by 10 centrifugal pumps through speed increasers having a 1:7.6 ratio. Normally the engine fuel for the Edmonton Station will be 95 per cent natural gas with a 5 per cent pilot oil charge. The Kamloops and Black Pool Stations will operate on 100 per cent crude oil as will the Edson Station.

Up and over—here coat and wrap is being applied over weld by hand due to the terrain.

Power at the Edson Station is supplied by three 6-cyl Nordbergs rated 1320-hp at 500 rpm. These units drive single-stage 10 by 12 pumps through 1:8.2-ratio speed increasers. Due to the high static head to be overcome, Edmonton, Kamloops, and Black Pool units will operate in parallel while the units at Edson will operate in series.

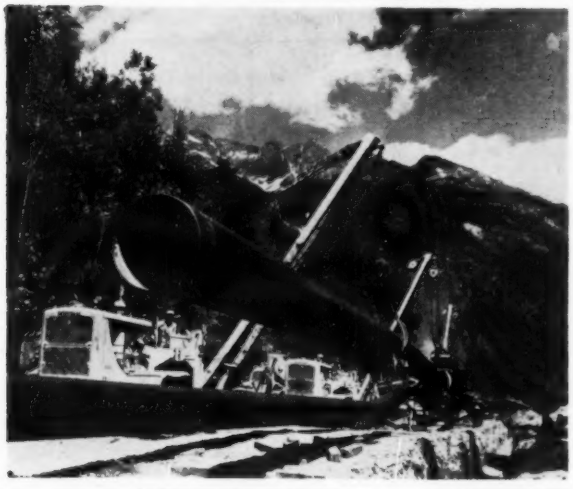
From outward appearances, all pumping stations are the same in that each main pumphouse measures 140-ft by 65-ft, and is of rigid steel frame construction with concrete block walls and corrugated "Transite" roof.

Building heating is accomplished through the utilization of waste heat boiler silencers. To supplement the waste heat boilers, oil-fired boilers have also been installed. In the three stations burning crude oil, heat is also required to heat the fuel in order to obtain higher filtering efficiency. In cleaning up the crude, it is passed through various settling and filtering stages and centrifuged before reaching the day tanks.

The crude oil filtering system has been designed by Winslow Engineering and is comprised of a series of jacketed filters of increasing density with elements treated for removal of moisture and solid particles as

Above, a welding crew working down hill in rocky terrain. Rock was encountered in about 5 percent of the entire route covered.

Below, coat and wrap machine in operation.



Principal Equipment

Engines	Nordberg Mfg. Co.
Pumps	Bingham
Speed increasers	Dominion Engineering
Fuel Oil System	
Centrifuges	Sharples Corp.
Transfer pumps	Geo. D. Roper Corp.
Circulating pumps	DeLaval Steam Turbine Co.
Filters	Winslow Engineering Co.
Strainers	Elliott Co.
Lube Oil System	
Purifiers	Winslow Engineering Co.
Standby pump	DeLaval Steam Turbine Co.
Conditioner	U.S. Hoffman Machinery Corp.
Cooling Water System	
Intercooler pumps	Ingersoll-Rand Co.
Jacket water pumps	Ingersoll-Rand Co.
Automatic temperature regulator	Fulton Sylphon
Exhaust silencers	Maxim Silencer Co.
Exhaust flexible connections	Flexonics Corp.
Intake air filters	American Air Filter Co., Inc.
Starting air compressors	Ingersoll-Rand Co.
Generating Sets	
Engines	Dominion Engineering Cooper-Bessemer Corp., Caterpillar Tractor Co.
Generators	Canadian General Electric Co.

well as the neutralizing of dissolved sulphur compounds. The system is designed to improve mechanical filtration and control possible acidic action. The removal of dissolved compounds and moisture is also designed to break any bond which might tend to form sludging action within the fuel. Provision has also been made to recirculate the heated crude through one of the filtering stages. Before reaching the engine, the crude is passed through "Duplex" filters on the engine.

In the case of the air filters, it was necessary to raise the intake well above ground level to eliminate trouble during winter snows. The location of the pumping stations also called for an oil which would function satisfactorily in an air cleaner at -40°F.

Emergency Power Too

Adequate provision has been made at each station for emergency operation or dead-plant starting. At Edmonton and Kamloops, electrical power for station operation is normally supplied by commercial power ties. However, should a power outage occur, these stations are protected by emergency diesel-electric generating sets. At Edmonton, a 300-kw Caterpillar set will supply standby power, while at Kamloops a 235-kw unit of the same manufacture has been installed.

The Edson and Black Pool Stations do not have any outside power ties and are supplied by a 212-kw Dominion set and a 300-kw Cooper-Bessemer set, respectively, for both normal and emergency power. In addition, all stations are equipped with one 3-kw automatic-starting engine-generator set.

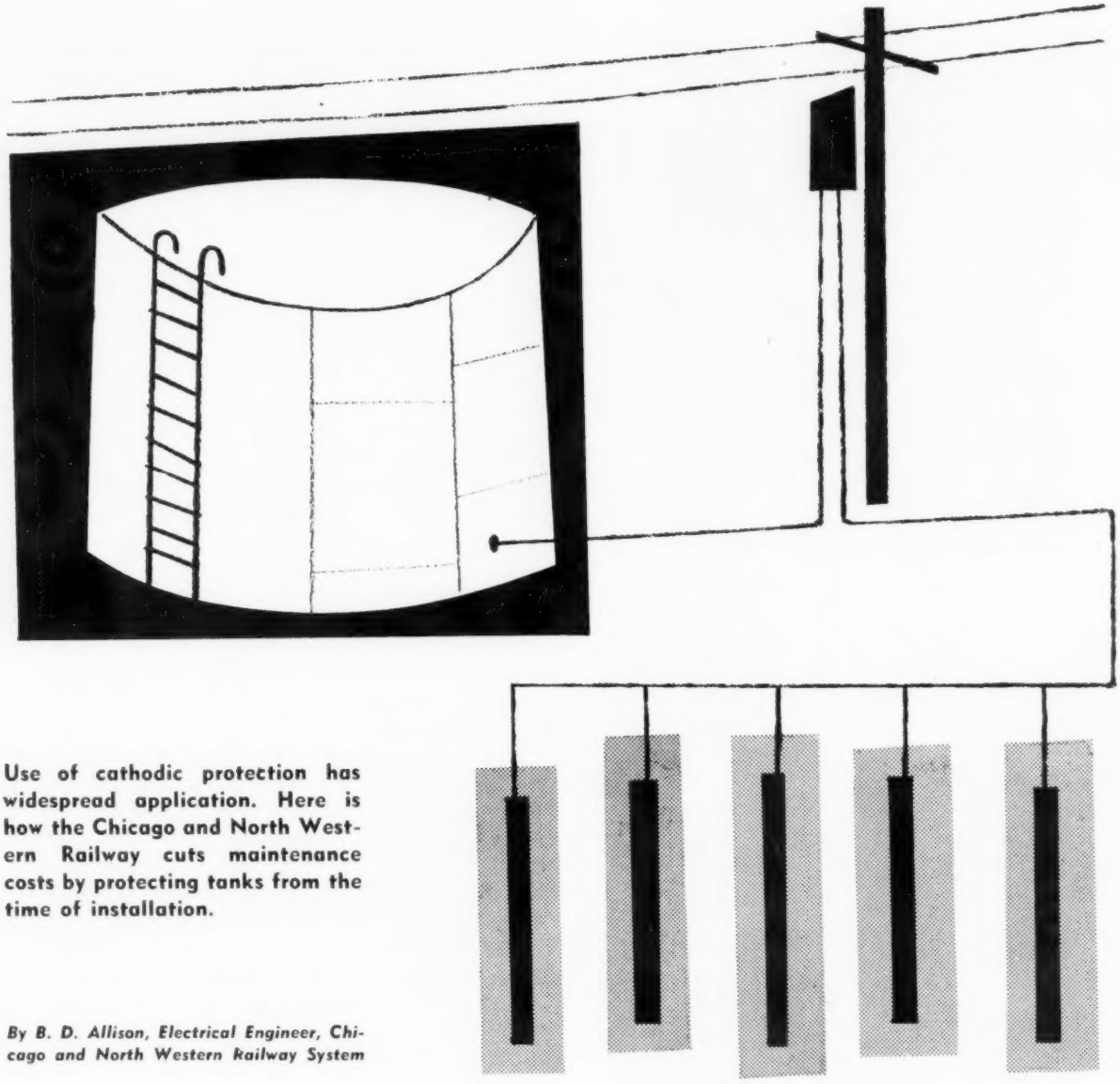
Also included in the station equipment are two Ingersoll-Rand air compressors, each with a discharge pressure of 250 psi. These units are used primarily to charge starting air bottles. When dried, filtered, and the pressure reduced to 40 psi, the starting air provides a supply to operate instruments and air-actuated automatic controls. One air compressor is motor-driven and the other engine-driven.

Housed in the fire pump building at each station are duplicate water pumps capable of delivering 500 gpm at a 120-psi pressure. Fire pumps at the terminal points are rated 1000 gpm at 80 psi. As with the air compressors, one pump is motor-driven and the other engine-driven.

Communications

Connecting all offices, stations, terminals, and maintenance crew headquarters are both telephone and teletype. Telephones are of the selective electronic tone-response ringing type. In addition, there are nine fixed and 25 mobile dual-frequency radio stations employed in the operation. The latter are company-owned and operate on either "Medium" or "Very High Frequency".

In addition, the route will be patrolled by helicopter at regular intervals. According to current information, this will be on a seven to ten day frequency. Aircraft will also be stationed at Kamloops for personnel movement and for emergency call-outs.



Use of cathodic protection has widespread application. Here is how the Chicago and North Western Railway cuts maintenance costs by protecting tanks from the time of installation.

By B. D. Allison, Electrical Engineer, Chicago and North Western Railway System

Cathodic Protection of Storage Tanks

APPLICATION of cathodic protection to prevent corrosion damage to diesel fuel oil and water storage tanks has proven an economical investment. Now every tank erected by the Chicago and North Western Railway System is protected upon installation.

Until about two and a half years ago, fuel storage tanks on the C&NW were of such small capacity that they could be mounted horizontally in concrete cradles and protection was a simple matter of painting. The rapidly expanding size of the diesel locomotive fleet however, has made it necessary to enlarge the servicing facilities and expand the fueling capacities of each servicing point. At this writing, nine fuel storage tanks, ranging in size from 150,000 gal to 1,000,000 gal, have been erected vertically at eight division locations.

The tanks were set on the ground with a 14-in sand pad under each one. Because of the relatively low-load soil bearing characteristics all but two of the new tanks were set in concrete rings to prevent settling out of plumb or loss of bottom support with consequent bulging.

Corrosion and Protection

Inasmuch as cathodic protection is a newly acquired requisite, it might be well to state briefly the nature and

cause of corrosion as related to underground and submerged metal structures.

Buried or submerged metal structures, or those resting on the ground surface as in the case of fuel tanks, are of course subject to corrosion. The rate of attack is accelerated by such factors as inequalities in the metal itself, soil acidity, degrees of aeration, and the like.

In many respects, the action is similar to that which takes place in a galvanic cell or battery. In this reaction, current flows between two poles with a resulting deterioration of one pole. As corrosion proceeds, particularly if accompanied by pitting, the metal structure is weakened or honeycombed to the point of uselessness, requiring costly replacements.

A cathodic protection system consists of five main parts: the structure to be protected; the environment surrounding the structure; a direct current source, which usually is a rectifier; an anode system to distribute current to the structure; and the installation wiring to provide a continuous flow of current to the anodes. Fig. 1 diagrammatically illustrates the flow of current from the buried anode to the steel surface.

In designing a cathodic protection system, the first step is to determine the amount of current required to provide complete protection to the tank bottoms. Potential measurements of the tank bottom are taken with the aid of copper-copper sulfate half-cells. The electrical resistance of the soil likewise must be tested, with a check test of the structure-to-soil potential.

On the basis of these findings, the correct current requirements to provide complete protection can be calculated closely enough to serve as a bench mark and later adjusted as necessary after the system is in operation. The criterion that has been proved and accepted by authorities is a structure-to-soil potential of minus 0.85 volt as measured with a copper-copper sulfate half-cell.

We were aware of the high economic losses resulting from the destruction and replacement of tanks, product loss, disruption of vital services, fire hazard, and other factors. We insisted therefore that as the larger tanks were erected on the ground, protection against corrosion must be a fixed part of the program.

Being convinced also that an applied current ground anode system was the most efficient and economical long-term investment, the Harco Corporation was contracted to engineer and install cathodic protection for each tank as it was erected. In addition to the nine tanks now built and protected, two additional installations are allocated in the budget.

The tanks, varying in size as they do, and the soil structure at each location having its own characteristics, each of the ground anode systems is individually engineered. The overall pattern is standardized however, differing only in the number of ground rods required at each tank and the capacity requirements of the rectifier to adequately carry each load demand.

The accompanying tabulation, Fig. 3, gives all the pertinent data on the operating installations; the two scheduled additions have not been calculated as yet.

At each tank location, excepting two, three 3-in by 60-in "National" graphite anodes are placed vertically in the ground, surrounded by coke breeze or prepared backfill in accordance with accepted practice to increase the effectiveness of each anode. The anodes are placed at the proper calculated distance from the tank. The positive side of the pole-mounted rectifier unit is connected to the anodes which are interconnected, while the negative side of the rectifier take-off is bonded to the tank, thus establishing a continuous electric circuit flowing from the anodes to the tank. The other two tanks are protected by six 3-in by 60-in anodes; the larger number being necessitated by the high resistivity of the soil.

Rectifier units provided for each tank are designed to provide years of trouble-free service. They consist essentially of an AC power line with input switch and fuse or circuit breaker, a transformer to reduce the AC line voltage, and the rectifier. Transformers have several low

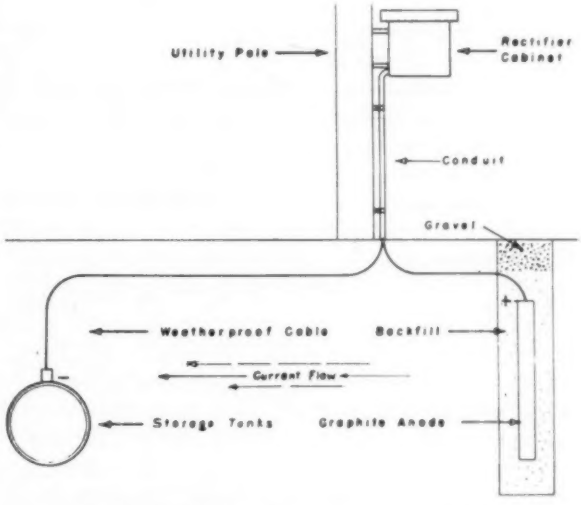


Fig. 1 Schematic diagram of a cathodic protection installation.

voltage windings which lead to the adjusting blocks. This secondary voltage then goes to the rectifier stacks where it is changed to direct current.

DC stack output is fed through an ammeter and voltmeter and then to the output terminals. The positive wire is always connected to the anodes and the negative to the structure being protected.

The system is set at a recommended amperage which should be maintained at all times. The ammeter is a visual means of checking the current flow and is subject to small adjustments from time to time as the protected surface polarizes by becoming covered with a hydrogen

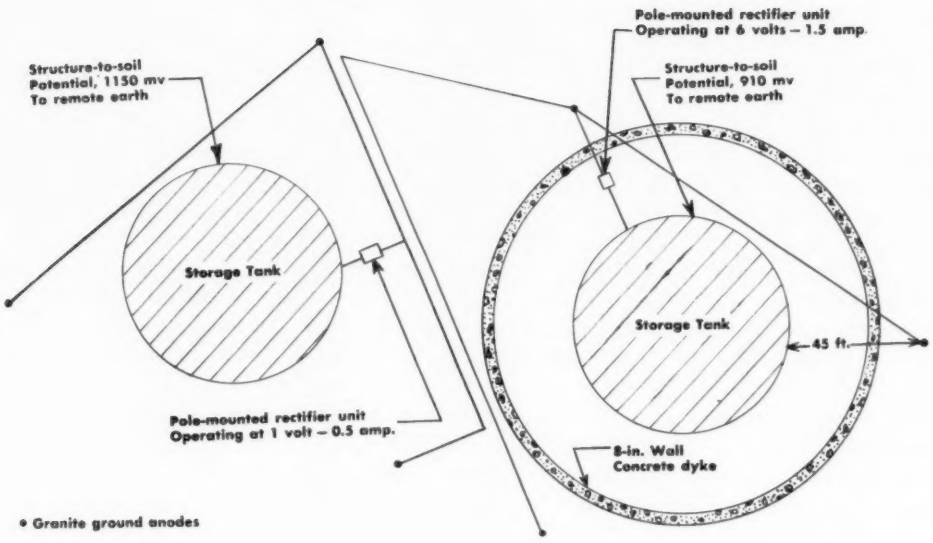


Fig. 2

Typical Diesel Fuel Oil Storage Tank Cathodic Protection Installation.

film, or as the anodes deteriorate. Design life of the graphite anodes generally is 10 or more years during which time no maintenance is required.

Each year, the system should be checked with a copper-copper sulfate half-cell and a high-resistance low-scale DC voltmeter (100,000 ohms/volt, 0-1 or 0.5). These readings are a periodic crosscheck of the monthly readings to verify the proper amperage setting of the unit.

Water Tanks

The railroad has also applied impressed-current cathodic protection to some 30 water tower tanks, ranging in size from 47,000 to 150,000 gal each. These installations differ from the fuel storage tanks in that the graphite anodes, generally of a smaller size than those used for ground bed systems, are inside the tank.

FIG. 3

LOG OF CATHODIC PROTECTION SYSTEMS

Location	Tank Capacity Gallons	Soil Potential Millivolts	Operating Volts	Operating Amps.
Milwaukee, Wisc.	150,000	1300	24	0.5
Butler, Wisc.	150,000	2500	24	0.5
Proviso, Ill.	1,000,000	960	6	34
Altoona, Wisc.	150,000	1150	24	1.0
Escanaba, Mich.	150,000	2500	24	0.2
Chadron, Nebr.	150,000	1100	11	0.25
Norfolk, Nebr.	150,000	1650	2	0.2
Boone, Ia.	150,000	1150	1	0.5
Boone, Ia.	150,000	910	6	1.5

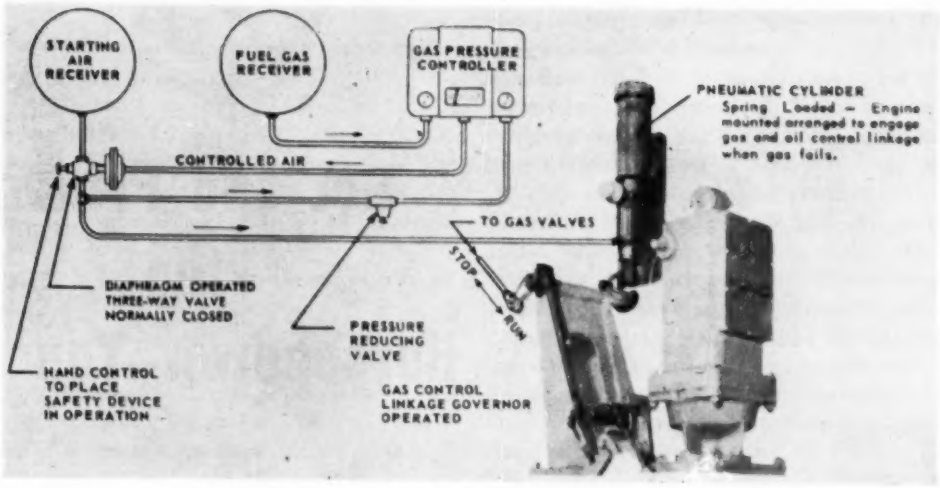
Since most water tanks freeze, the anodes are designed for a 1-year life. They either are replaced in the spring when ice danger is passed, or they may be removed in the fall and replaced in the spring. For water protection, likewise, a separate rectifier is used at each tank. Small adjustments in the rectifier output setting may be required from time to time since the composition of the water may change seasonally and also for the reason that the water level in the tank does not remain constant.

Water tank units should always be adjusted for proper amperage output with the tank full of water. In general, the same meter reading schedule and regular checkouts of the system is followed as with fuel tanks. Our chief interest in applying cathodic protection to water tanks is to keep maintenance costs at a minimum and to eliminate tank repair or replacement.

Economics

Economic benefits of cathodically protecting diesel fuel storage tanks are very real and yet difficult to reduce to a dollar and cents basis in the absence of comparative operations. The erection of large tanks on the ground is a new practice with the Chicago and North Western.

At the end of about 30 months of operation, we know that maintenance has been a negligible factor and that we have not had tank leaks, product loss, repair expense, and service interruptions that belabor the owners of unprotected storage tanks. The small installation cost of an impressed-current ground anode system and the minor expense of operation and routine checking are a modest sum to pay for such trouble-free fuel storage tanks.


STARTING AIR RECEIVER
FUEL GAS RECEIVER
GAS PRESSURE CONTROLLER
PNEUMATIC CYLINDER
Spring Loaded — Engine mounted arranged to engage gas and oil control linkage when gas fails.
CONTROLLED AIR
TO GAS VALVES
STOP
RUN
DIAPHRAGM OPERATED THREE-WAY VALVE NORMALLY CLOSED
PRESSURE REDUCING VALVE
HAND CONTROL TO PLACE SAFETY DEVICE IN OPERATION
GAS CONTROL LINKAGE GOVERNOR OPERATED

Worthington's "Automatic Fuel Switcher"

Recently announced by the Worthington Corporation, the new fuel switcher is designed to eliminate shutdowns which occur when depending on manual changeovers during emergencies.

DEVELOPED by Worthington engineers, the "*Automatic Fuel Switcher*" is designed to improve operation of Worthington dual-fuel engines by providing automatic changeover to fuel oil. In actual use, the fuel switcher places the engine under control of the governor, utilizing full governor travel whether operating on gas with pilot oil or 100 per cent fuel oil.

Previously, only half the governor travel was available for either gas or oil to provide the automatic changeover, resulting in erratic regulation on generator service. The sequence of operation for the fuel switcher is simple.

First, the engine is started and brought up to speed on oil fuel. Then, before manually changing over to gas, the automatic system is engaged so that it will be ready to act in the event of gas failure.

The system is engaged and placed in balance by opening the high pressure air valve (actuated by small knob on 3-way valve). Air is then admitted to the pressure controller through the air reduction valves and to the pneumatic cylinder mounted on the engine.

Through action of the controller, the high pressure air supply valve is held open as long as the gas pressure is at or above an indicated minimum pressure desired for the engine. Until the gas pressure falls below the minimum or fails completely, low pressure air from the controller, acting on the diaphragm, always holds the high pressure air supply valve open.

In its raised position, the vertical plunger in the pneumatic cylinder, responding to air pressure, unbalances a compression spring. In this position, the plunger remains disengaged from the levers that are connected to the gas and oil control linkage.

When gas pressure falls below the minimum required for the engine, the pressure controller releases air to the diaphragm valve which then shuts off the supply air and releases pressure on both the pneumatic plunger and pressure controller.

Up until the time that a failure occurs, gas metering valves remain under the control of the governor. However, at the instant of gas failure, air pressure in the pneumatic cylinder is released and the plunger, under spring pressure, engages the changeover linkages. Immediately this action closes gas metering valves, opens fuel pumps, and transfers governor control exclusively to the fuel oil system. When gas supply is restored to normal, the sequence of changing the engine back to gas and again placing it under control of the governor and the "Automatic Fuel Switcher" may be repeated.

Get and Protect the Horsepower You Buy

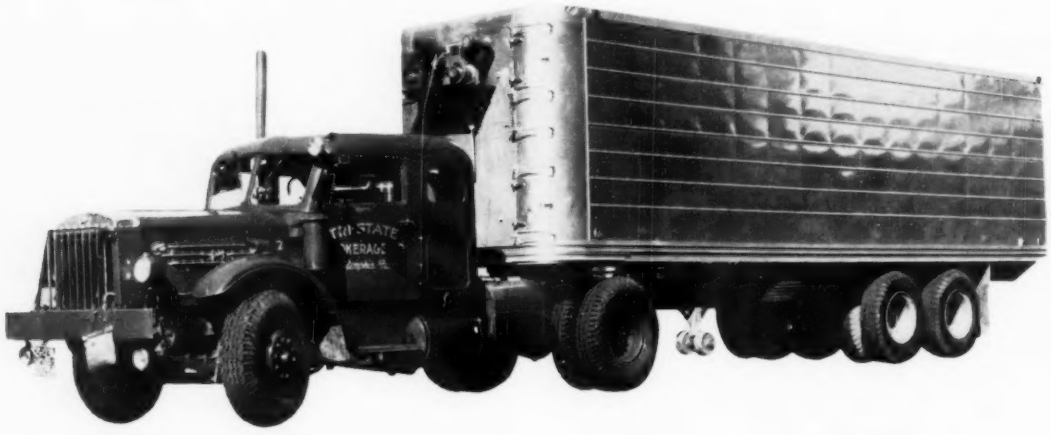
By H. E. Bollwinkel,

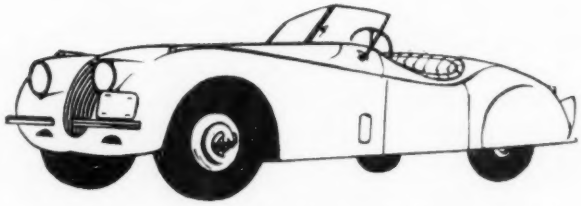
Executive Service Manager, Cummins Engine Company

DRIVERS of these popular small sport cars and the fellows wheeling the big tractor-trailer combinations over the roads have a lot in common. Both have to learn how to make the most of the horsepower available to them, for in both cases the ratio of horsepower to vehicle weight is low when compared to today's pleasure car.

To stay with the flow of traffic and in the case of trucks, maintain schedules, you must utilize the available horsepower most efficiently. Selection of truck engines requires careful consideration. It is a service that imposes limitations on the size, weight, and horsepower for both physical and economic reasons. Common practice is to provide an excess power of 25 per cent over that required to pull the loaded truck on a level road at the desired maximum road speed.

This excess power must take care of the additional power necessary for pulling grades and for acceleration. But unless the nature of power produced by an engine is fully understood, this reserve for meeting road conditions may not be realized. Equally important, failure to get the most out of the engine is frequently the result of practices that will shorten the engine's service life.





One truck consistently outperforms another and operates economically for many more thousands of miles before it needs an overhaul. Why? Here are some of the operational considerations that can provide the answer.

So there is a double-barreled incentive to operate engines more efficiently. Let's see how it can be done.

Getting Maximum Horsepower

First, let's review the nature of horsepower. A familiar formula is shown below:

$$Horsepower = \frac{Load\ (or\ Torque) \times Speed\ (or\ RPM)}{5252}$$

The fact that engine speed is involved shows that the rate of doing work is part of horsepower. The load or torque represents the lb-ft of force exerted on the crankshaft, causing it to rotate. It can be seen that if the torque or load remains constant, horsepower will change in proportion to the rpm.

Since the load or torque required will be largely dictated by operational conditions, the rpm is the principal factor under control of the operator. Thus it is possible to get an approximate correlation between en-

gine rpm and horsepower available. Of course, the horsepower-rpm correlation varies for each engine model.

Utilizing the Horsepower

Even when maximum horsepower is developed, it will not be sufficient to meet all operating conditions unless properly applied. Maximum torque as produced by the engine, may not be adequate for pulling grades or for acceleration. That's where gearing (a form of torque multiplication) comes in. The use of main and auxiliary transmissions and 2-speed rear axles makes various engine-speed to vehicle-speed ratios available. It is up to the driver to make the most of his gear splits.

When conditions pull down engine rpm (and horsepower), the driver must shift to a lower gear. It is a matter of trading vehicle speed for additional power where in the final analysis it counts—at the wheels. If this is not done and engine rpm is pulled down, the engine is being "lugged".

Avoiding Lugging

In addition to the loss of horsepower, lugging should be avoided because it harms the engine. It will reduce combustion efficiency, causing smoking, deposits on valves and rings, and unburned fuel will dilute the lube oil. High cylinder and exhaust temperatures will also occur.

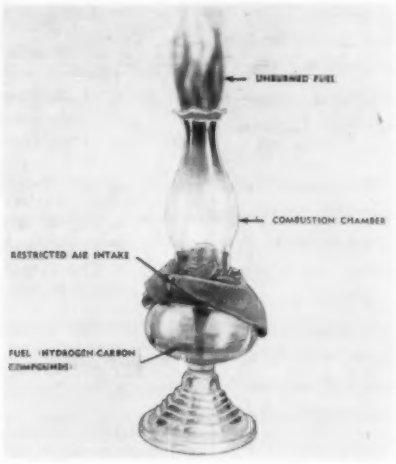
Lugging can occur at both full and partial throttle. The mechanical governor on Cummins truck engines automatically regulates fuel delivery to hold idle speeds to about 515 rpm. It also prevents overspeeding at partial loads; and at maximum engine rpm, regulates fuel delivery to compensate for load variations. Intermediate speeds are controlled by the foot throttle.

Ability to accelerate or "find the governor" during partial-throttle operation shows that the engine is not lugging. When you can get that little extra power, you are sure that the torque requirements have not reached the point of maximum fuel delivery and so cannot be pulling down the rpm. If the accelerator is wide open (maximum fuel delivery) and engine rpm drops more than 200 rpm below the governed speed, the engine is being lugged. Cruising speed for engines in automotive service approaches continuous-duty operation. Engine rpm should be held about 200 rpm below the maximum rated speeds by letting up on the accelerator. By driving below the governor, the driver can accelerate to catch his next gear. After shifting, he can step it up to full throttle for maximum engine speed and full horsepower to pull the grade.

In general, best results are obtained from the engine when the rpm is maintained as consistently as possible at the upper end of the speed range by proper use of gear splits.

On the other hand, excessive speeds are harmful. The governor will control maximum rpm when the engine is pulling, but when the engine is being used as a brake in downhill operation, it has no control.

Centrifugal and reciprocating forces increase as the square of the rpm and can actually cause the engine to fly apart. Before this occurs, serious damage can result. Pistons may strike valves before the springs can close them, excessive loads will damage bearings, etc. Overspeeding must be avoided.



Too little air or too much fuel cause smoke.

Altitude and Temperature

Engines leaving the factory or the dealers' shops must be set to meet average conditions. These usually envision operation below 1000-ft altitude and ambient temperatures up to 90°F. They will deliver their rated horsepower with standard fuel pump settings without objectionable exhaust smoke.

When higher altitudes or temperatures are encountered, maximum fuel delivery must be cut down at the fuel injection pump or by gear shifting and avoidance of lugging. The higher temperatures and altitudes will both result in a less dense charge of air (less oxygen per cu ft) entering the cylinders. Since the amount of fuel that can be burned depends upon the weight of air available, it can be seen that less power will be produced with rarefied air.

The driver can do nothing to change the basic conditions, but by understanding what's going on can minimize

harmful results. It is *not* the answer to jimmy up governor or fuel pump settings which might produce temporary horsepower gains at the expense of engine life, but to use the available horsepower more effectively through proper gear selection.

Improving Engine Life

A driver can go further in increasing engine life by observing a few simple precautions. For example, he should avoid cold starts and hot stops. When the engine is cold, the oil is viscous and will not flow properly to all the parts needing lubrication. Also, the engine parts have not established their hot running clearances. The engine should be allowed to come up to temperature before full load and speed are applied. Serious wear, scuffing and galling of the parts can occur unless this precaution is taken.

Hot stops are also harmful. A lot of heat is stored in the metal masses and is controlled only by cooling water circulation. When the engine stops, circulation stops and the excess heat is not carried away by the water. "After-boil" may occur in localized spots and thermal stresses can cause warping or cracking. Let a hot engine idle for a short while before shutting it down.

Judgment is always necessary. We have outlined two extremes, but there is an area for judgment in-between. The engine is idled to let it cool off before shutdown, but idling temperatures are too low for prolonged operation. Long idling periods should be avoided. Diesels operate best at their design temperatures.

Our engines have thermostats set to maintain a cooling water temperature of 160°F to 185°F under all normal operating conditions. The best operating temperature is 170°F. Any other thermal control device such as variable-pitch fans, radiator shutters, etc., should be set to close at 168°F and open at 175°F. Subnormal temperatures cause incomplete combustion. This will show up in a smoky exhaust, lube oil dilution, crankcase sludging, and carbon deposits on valves, rings ,and guides.

The driver is in the best position to know when things are going wrong and should take action. He should take direct action where possible and in other cases cooperate with the maintenance crew. This action may be simply making a complete and timely report of some irregularity. Every bit of information will help them in diagnosing the trouble.

Most mechanical failures give warning before something lets go. Drivers should be alert to heed the signs (unusual noises, sudden drop in oil pressure, high water temperatures, etc.), and immediately shut down the engine. A delay of 10 seconds after a bearing failure causes a knock that may result in a ruined crankshaft. A 5-second delay is often enough to cause a broken connecting rod to come through the block.

Summary

Proper driving habits and driver alertness is the first line of defense in the battle for more efficient and economical service. Through an understanding of the elements of efficient engine operation, drivers can get maximum horsepower from their engines and apply it more effectively. This process, plus a few simple precautions, will also increase the engine's service life.

Finally, alertness of the driver to unusual conditions and prompt action will frequently forestall serious failures. Then, full cooperation with the maintenance crew will help in maintaining better engine condition.

This is one way to get and protect the horsepower that you buy.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 75 to check them.

1. "Lugging" an engine is considered very bad practice. Which of the following is most descriptive of the condition?
   a. Overloading beyond the full rated horsepower
   b. Overloading beyond the horsepower capacity at any given engine speed
   c. Failure to supply sufficient fuel to meet load

2. For maximum efficiency, best operation, and long service life, vehicular engines should be operated—
   a. at as consistent a speed as possible
   b. at the lower end of the speed range
   c. at the high end of the speed range

3. Scavenging or supercharging blowers of the intermeshing lobe type require "timing". This means that:
   a. It must be set in angular relation to the crankshaft
   b. Angular relation of the two rotors must be set
   c. Cfm output per unit of time must be checked to match engine air requirement in same period

4. Horsepower requirements of mechanically-driven, positive-displacement superchargers are only dependent upon the inertia and frictional losses involved.
   a. True b. False

5. "Wicking" as applied to impingement-type filter adhesive coatings refers to its property of—
   a. dispersing on the filtering media
   b. forming sticky wick-like strands
   c. wetting through successive layers of dirt

6. The more adhesive that you can get to stick on an air filter panel, the better.
   a. True b. False

7. To increase the throughput of a pipeline, it is only necessary to increase the pumping power, usually in the form of booster stations in direct proportion to the desired increase.
   a. True b. False

8. Metal structures, buried, submerged, or resting on the ground are subject to corrosion. The action is similar to—
   a. the phenomena in a galvanic cell
   b. rusting of any exposed ferrous metal
   c. chemical attack by acids

9. Dialectric strength of electrical insulation should be checked periodically using a:
   a. ammeter b. voltmeter
   c. ohmmeter

Fig. 1 One of the Southern's latest 4-unit freight locomotives similar to the one used for the tests.

Increasing Locomotive Air Filter Efficiency

By F. J. Hanley[1], B. F. Kline[2], and A. W. Hardy[3]

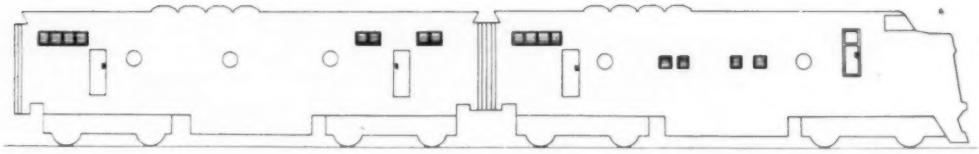


Fig. 1a illustrates the location of carbody filters on one side of an "A" and "B" unit.

Southern Pacific's need for improved air filter efficiency led to an extensive investigation of filter coating materials. Results and procedures are given.

WHAT could be done to improve air filter efficiency and reduce maintenance required for locomotive air filters? In an effort to find an answer, the Southern Pacific enlisted the aid of an air filter manufacturer and a supplier of dust-catching adhesives.

After joint preliminary investigation, a cooperative test program was adopted under which Southern Pacific's test department investigated air filter maintenance and service factors; the filter manufacturer (Farr Co.) supplied technical aid and use of laboratory wind tunnel testing equipment; and the California Research Corp. investigated the requirements and characteristics of the materials used for filter adhesive.

In field tests following laboratory investigations, a 4-unit EMD Type F7 diesel freight locomotive in service between Roseville, Cal. and Sparks, Nev., a particularly tough piece of railroad was used. From Roseville (elevation 200 ft, and 18 mi east of Sacramento), the operation eastward is 84 mi upgrade to the Sierra Nevada crest (7000-ft elevation) and then down the eastern slope (52 mi) to Sparks (4400-ft elevation).

On the slow uphill operation, sanding is necessary and practically continuous. Dust from sanding operations is blown out from under the locomotive trucks by traction motor blower exhaust and billows up reaching air filter level toward the rear of the lead unit, enveloping the three trailing units.

The oil-wet impingement-type filters used in these tests employ herringbone crimped layers of galvanized wire screen. This design is to provide air turbulence for high filtering efficiency over a wide range of particle sizes, low pressure drop at all reasonable dust loads, freedom from plugging, high dust holding capacity through progressive loading of dust well into the body of the filter, and easy cleaning and recoating.

Use of metal fibers assembled into a regular pattern with uniform spacing (as in a screen) for the filter pack is necessary to obtain uniform density and prevent air channeling. While the design of the filter determines the probability of a dust particle striking a coated fiber surface as the air stream flows through the filter, the properties of the adhesive determine whether or not this particle will be retained in the filter.

Retention vs. Wicking

Oil has the ability to wet and hold dry dust particles as long as the oil film remains on the filter fibers in their path. However, regular oils have the disadvantage of flowing continually, through gravity, down and off solid

surfaces. This results in essentially dry surfaces that cannot hold impinging dust, and wasteful drainage which must be cleaned. The latter is particularly troublesome if it drains near cooling air intake of electrical equipment in which the oil may cause contamination and dust collection.

In addition to remaining on filter surfaces, the adhesive must wick through or wet dust particles as fast as they accumulate in order to present a continuously oily dust-catching surface.

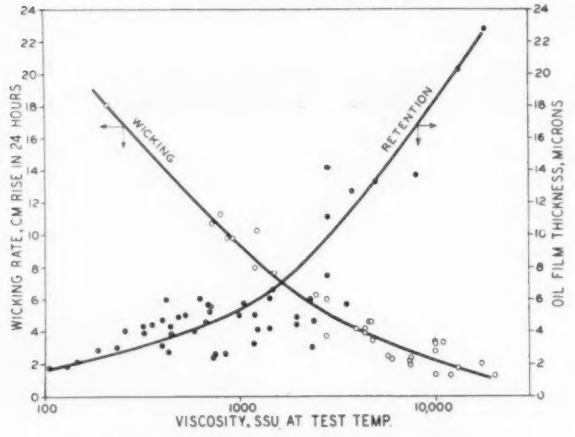


Fig. 2 Wicking and retention of various oils tested.

Fig. 3 Effect of temperature on retention. Two-hour storage at each temperature with equal weights of adhesive applied initially. (above).

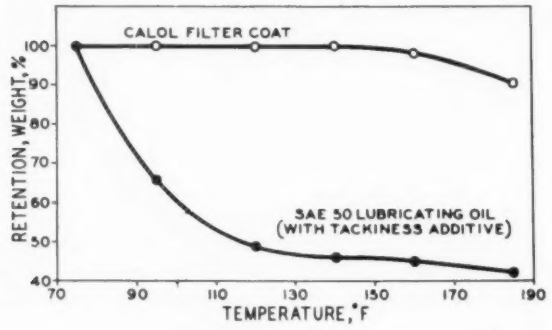
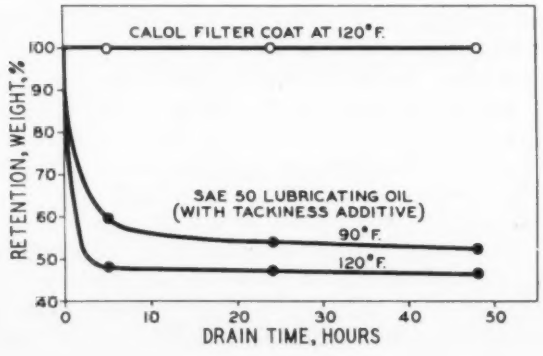


Fig. 4 Effect of drain time on retention. Equal weights of adhesive applied initially. (below)



The practice has been to compromise these two requirements in favor of the higher viscosity oils to secure maximum retention of oil on the filter media for the longest possible time at the expense of the wicking rate. However, the dust catching efficiency is then limited by the wicking rate of the oil rather than the mechanical design of the air filter. At high rates of dust loading, a high viscosity can seriously impair operation and allow passage of an intolerable quantity of dust.

As an example, consider an air filter coated with an SAE 50 lube oil, filtering air at 100°F. If the air temperature rises to 150°F, wicking rate would be at least double, but rate of drainage would be increased four times. Should air temperature drop to 50°F, wicking would be reduced to one-fourth or less of its 100°F rate although the oil would stay on the filter 8 to 10 times longer than at 100°F. Thus, if the temperature drops much below the selected condition, the filter becomes inefficient due to the low wicking rate of the filter adhesive. If the temperature rises, the filter becomes inefficient because of loss of dust-catching oil.

The basic conflict in flow requirements for wicking and retention is illustrated by Fig. 2 wherein data accumulated on a wide variety of oils were plotted against the viscosity of the oil at the test temperature. They performed strictly according to their viscosity and not their chemical composition.

Air Filter Adhesive Development

Various formulations were subjected to separate tests to determine retention and wicking properties. Overall performance properties were then evaluated in the Farr Company's wind tunnel and full-scale diesel freight locomotive service tests. Throughout these tests, a regular SAE 50 grade lube oil with a tackiness additive was used as a standard of comparison, being representative of the most common usage.

While several promising compositions were discovered, all but the one, "Calol Filter Coat" were eliminated by the rigorous screening tests before reaching the field test stage. These tests are discussed next, only in terms of comparative results obtained on *Calol*.

Retention Tests

One laboratory test used was to dip a 1/16-in diam metal rod of known weight into the test oil followed by draining in an oven at a specified temperature for 24 hours. After this, the rod was again weighed to find the weight of oil retained. Comparative results obtained follow:

Relative Retention	SAE 50 Oil (Tacky Additive)	Calol Filter Coat
24 hr draining at 75°F	8.7	195.0
24 hr draining at 200°F	1.0	7.1

Additional test results from California Research Corp. gave comparative data as shown in Figs. 3 and 4.

Flow Properties

The flow property of Calol is a function of temperature. Above 160°F, it behaves flow-wise like an oil with a viscosity index of 124. This permits its application to the

filter by conventional methods employing a hot dip, followed by centrifuging or hot cabinet storage to remove excess material. In this respect, the adhesive acts like grease, remaining in place when cool and easily applied when hot and fluid.

Below 160°F, it is a soft grease-like material that remains on the filter media as a thick film resisting the removal forces of gravity and air flow. The material can be pumped at temperatures below 160°F provided that a positive suction pump is used to apply sufficient pressure to exceed the material's yield point.

Wicking Tests

One laboratory test is to immerse one end of a glass tube packed with a classified dust in the test oil. The rate of oil rise in the dust column in the tube is determined as a function of time. Comparative results obtained from this test are as follows:

	SAE 50 Oil	Calol Filter Coat
Relative wicking rate at 75°F	1.0	2.1
Relative wicking rate at 200°F	7.3	5.8

Qualitative wicking test results performed to determine the effect of low temperatures on this property of Calol are shown in Fig. 5.

Water Resistance Test

While there are no quantitative tests or specifications for this property, resistance to removal of the adhesive by possible contact of the filter with water from car washing machines or heavy rains is generally recognized as a service requirement. To determine this property, the test conditions, and results are shown in Fig. 6 and accompanying notations.

Wind Tunnel Test

An extremely accelerated wind tunnel test cycle developed for evaluating the effect of cycling air temperature on the filtering performance of the adhesive is as follows:

1. Air at 70°F and 545 fpm, containing the "slugging" concentration of 70 grams of dust per 1000 cu ft of air, is fed to the adhesive coated filter for 10 min and the filtering efficiency is determined. (Filtering efficiency is the ratio of weight of dust retained to weight of dust fed to the filter).

2. Air at 200°F and 545 fpm is passed through the filter for 10 min.

3. Steps 1 and 2 are repeated successively to determine the rate of decrease of filtering efficiency versus the number of dust loading and heating cycles. Comparative data from this test are shown as follows:

Filter Adhesive	Adhesive on Filter, Wt % of Screen Pack	Dust Feed Rate gms/min	Filtering Efficiency % of Max. Theoretical Initial	2nd Cycle
Calol	12.4	2.1	98.2	95.4
SAE 50 Oil	4.5*	2.1	80.6	56.2

*Maximum amount that could be retained.

These tests also showed that *Calol* increased the dust-holding capacity of a Farr air filter some 40 per cent under controlled laboratory comparisons, with regular oils even under slugging dust concentrations. Efficiencies under these conditions were slightly lower than those under normal dust feed rates determined in the more precise, large filter test set.

Adhesive Application

Tests made on full-scale filters showed qualitatively that any desired amount of Calol could be applied

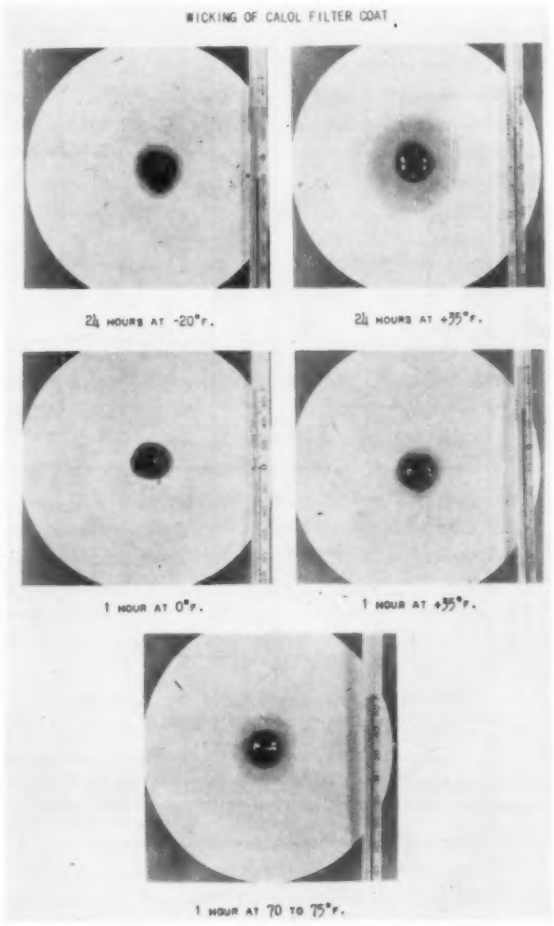


Fig. 5 Effect of low temperatures on Calol.

Fig. 6 Adherance of adhesives to steel in presence of water. Appearance 10 days after immersion Calol at left and conventional filter oil at right. Test Conditions: polished steel strip dipped at 180°F, drained and immersed in fresh water at 135°F, allowed to cool and stand at room temperature for 10 days. The strip at left shows no rust while the one at right shows rust over the entire surface.

and retained on the filter by varying the dip temperature and the centrifuging time. The optimum amount of adhesive for a filter had never been determined by performance tests because only a relatively small amount (3-5oz) of any of the regular oils could be retained over a reasonable test period.

It appeared that the optimum amount of adhesive would be the maximum that could be applied without "webbing over" or closing the screen holes. Filling of screen holes would reduce filtering efficiency by inducing air channeling.

It was found with Calol that 20 oz of adhesive per filter, or 15 per cent of the weight of the screen pack, was a practical maximum application. Each wire had a relatively thick uniform covering film and a reservoir of adhesive existed at each wire intersection with all screen holes open. Above this amount, screen hole webbing started.

Field Tests

An average of 10 oz of Calol was applied to each of the 80 air filters (64 carbody plus 16 engine intake) on a 4-unit EMD F7 freight locomotive used for the test. Each filter had previously been cleaned, tagged as to location on locomotive, and weighed. All filters were weighed individually at approximately 800-mi intervals in order to obtain progressive dust loading data.

Tests were conducted for one month. During this period, all diesel locomotives maintained at Roseville were serviced with Calol on a routine regular filter maintenance basis. This procedure allowed general information to be obtained on handling the material, application performance, cleaning the dirty filters, and other practical field data to supplement the specific test data.

Regular filter maintenance personnel were used without instruction or training in the use of the adhesive. The regular dipping tank temperature specification of 170°F to 190°F was continued.

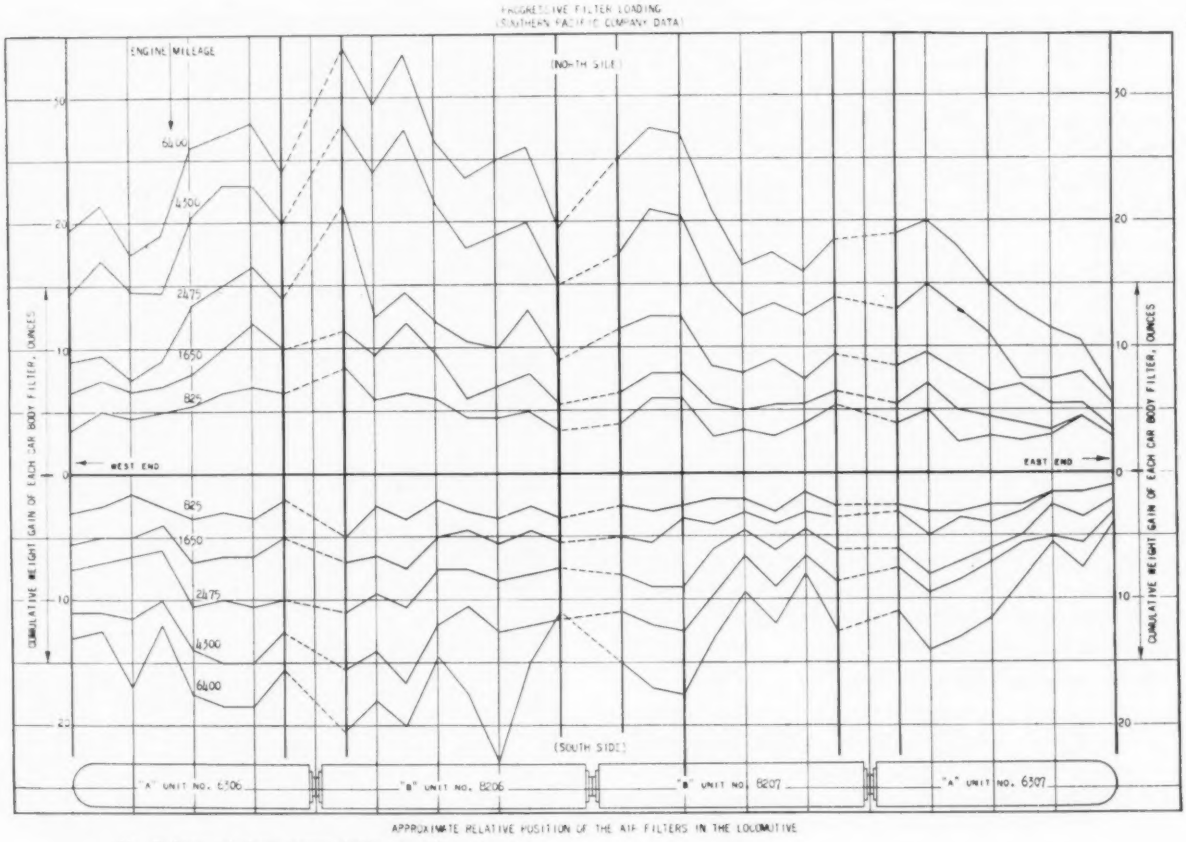


Fig. 7 Rate of dust accumulation on filters

Results and Comments

1. Duration of test was 6400 miles without cleaning or recoating filters. This is compared to regular filter change every 2500 miles with reference oil.

2. Total dust collected in the 64 carbody filters was 70 lb in the 6400 miles of operation.

3. Average filter loading of dust on carbody filters was 13.7 oz, south side; 21.3 oz, north side; overall, 17.5 oz per filter.

4. Capacity loading on any one filter was a maximum dust load of 34 oz. This filter showed a pressure drop of 0.268 in of water compared to 0.17 in for a clean, oiled filter at the standard air filter test condition of 520 fpm. Filtering efficiency for this 34-oz, dust-loaded filter was 83.4 per cent of the original efficiency. (Capacity load is considered reached when efficiency drops to 85 per cent of original. An oiled filter with 3⅛ oz of refer-

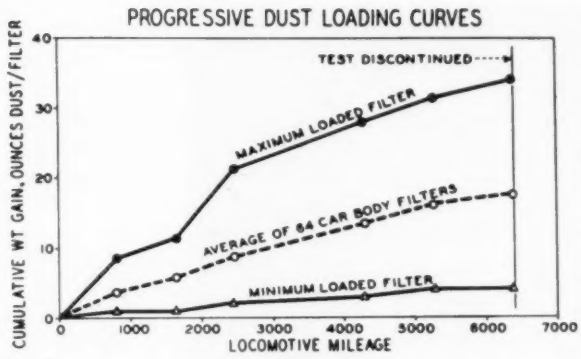


Fig. 8

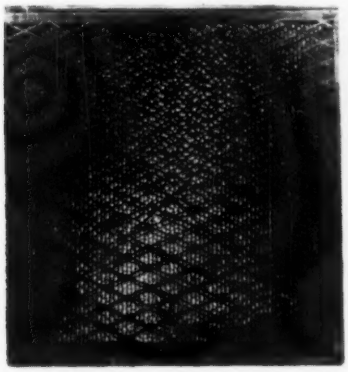


Fig. 9 An engine air intake filter at the end of a 30-day, 6400-mi test on a locomotive.

Fig. 10 Carbody filter at the end of a 30-day, 6400-mi test period on a locomotive.

ence oil drops below this figure at an 11-oz dust load.)

5. Reduced maintenance on all 40 freight units serviced with Calol at Roseville was found possible even before the end of the 30-day test period. This was obvious when the markedly improved condition of filters was noticed at the regular 2500-mi service period. The service period was then changed to 5000 miles for all units using Calol.

6. Adhesive retention in service eliminated troublesome drippage from all filters. Drip pans required on the hot running engine air intake filters were removed as unnecessary.

7. Greatest dust loading in this type of service occurs at the slow uphill pull as shown by Fig. 7.

8. Source of dust is mostly from sanding of the rails. The amount of dust is higher in the filters on trailing on the long uphill pull.

Analysis of dirt samples showed that chemical constituents predominating were silica, metallic iron, and iron oxide (wear products of wheels, brake shoes, and rail), with an appreciable amount (by volume) of carbon, presumably from engine exhaust gas recycling in the tunnels.

9. Rate of dust accumulation is shown graphically by Fig. 8. The 34-oz loaded filter (maximum obtained on this test) was judged on the basis of wind tunnel test results to be loaded to the capacity of the amount of filter adhesive originally applied (12 oz). These tests proved conclusively that had more adhesive been applied, the useful life of the filter could have been extended.

Assuming a maximum non-screen hole webbing application of 20 oz of Calol, it appears that close to 9000 miles of operation could be obtained in this service before reaching the 55 to 60 oz maximum dust load capacity estimated on the basis of above figures. These estimates are supported further by laboratory wind tunnel tests wherein it was shown that the same type of filter, with 20 oz of Calol, accumulated 56.1 oz of standard test dust with an average efficiency of 97.3 per cent of maximum theoretical and a final pressure drop of 1.010 in of water.

10. Engine filter vs. carbody filter conditions are shown by Figs. 9 and 10.

Conclusions

1. This new type of adhesive material has unique properties which permit its application by routine procedures in controlled amounts to suit service conditions. Its excellent wicking and retention characteristics permit sustained high filtering efficiency over a wide range of conditions and offer an extension of conventional service periods. It is very effective in excluding airborne abrasives from engines when applied to carbody and engine filter panels.

2. Changes in air filter location may be desirable in order to equalize the filtering duty among the carbody filters.

3. Rail sanding for traction is the major source of dust in this type of operation.

4. Additional quantitative data are needed on railroad air filtering requirements under the following conditions: high-speed desert operation in freight and passenger locomotives; pullman and passenger car service; and diesel switcher service.

5. Vigilant air filter maintenance is required to obtain maximum air filtering efficiency. A dry, loaded filter is only a little better than none at all.

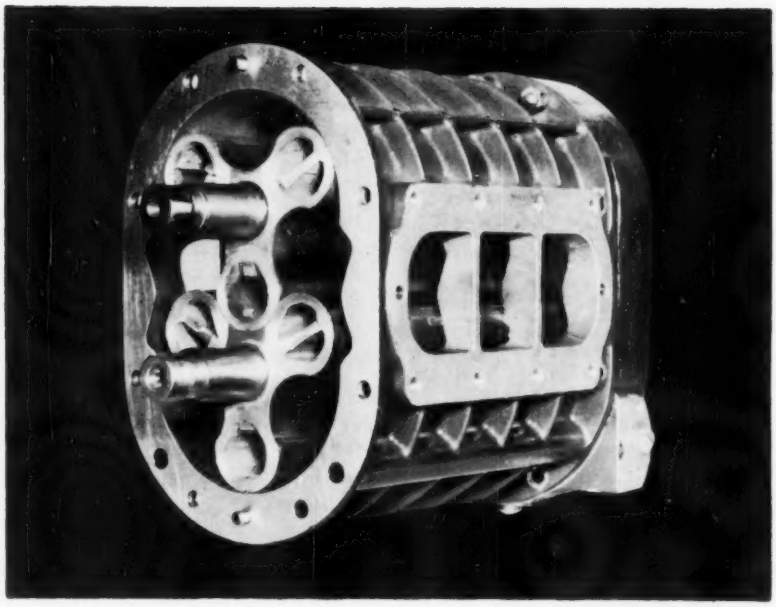
6. The economical limit of diesel air filtration needs to be established (i.e. what are the effects of abrasive particle size and concentration on diesel engine wear?) before firm air filter performance specifications can be established.

---

[1] Research Engineer, California Research Corporation.

[2] Chief Chemist, Southern Pacific Company

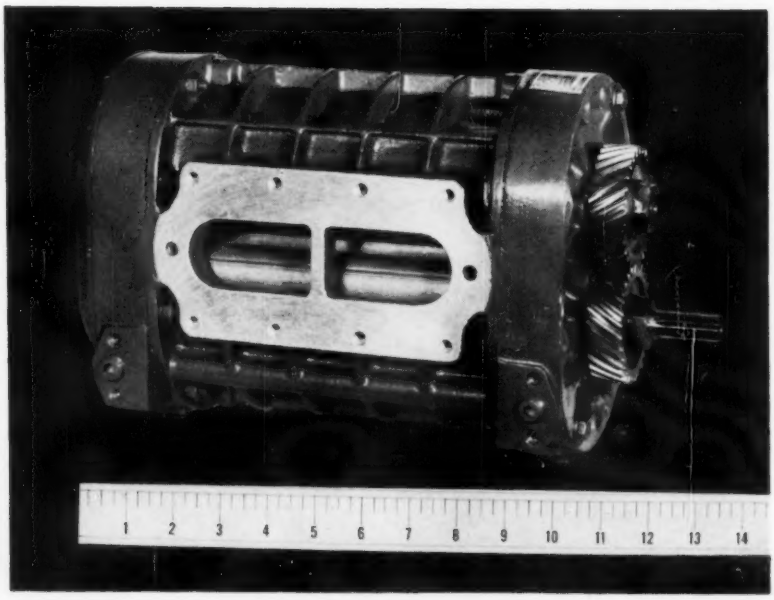
[3] Assistant Director Research, Farr Company Abstract of a paper sponsored before the Professional Divisions Conference of ASME by the Pacific Railway Club



A close look at the last port on the right will show the grid inside the blower which seals the end of the lobes and prevents leakage.

Supercharging to Improve Performance

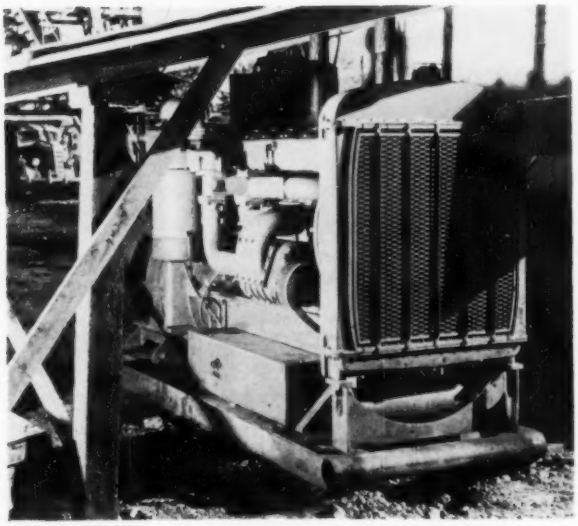
Some considerations in supercharger design with particular reference to the Miehle-Dexter superchargers.



A smaller model with the endplates and drive gears in place. These gears are also encased when the unit is completely assembled. Micarta strip which prevents leakage between lobes and casing can be seen on lobe through the port.

THE fellow who first coined the expression, "free as air", was not thinking in very practical terms. He wasn't much of an engineer because that fraternity is well aware of the fact that when you start to do something to or with air, it costs money one way or another.

To stir up the air on a hot day, an electric fan takes power. Moving air through the radiator of your car takes fan horsepower from the net engine output, in some cases 10 per cent or more at full speed. The engine itself "breathes" large quantities of air for combustion and there is a definite reduction in net horsepower attributable to air pumping losses. And diesels normally require more air than gasoline engines of equivalent displacement.



Here, a Miehle-Dexter blower has been placed in service on a diesel-electric generating set. In this case, it is belt driven from the engine crankshaft.

When it comes to packing more air into a cylinder than is provided by atmospheric pressure or supercharging, power is necessary. With mechanical superchargers, this power comes from the engine and thus reduces the net output. Obviously, the net power gain due to supercharging must well exceed the parasitic loss or there is no point to supercharging. Also, the greatest gain will be shown when the pumping power is held to a minimum.

This simply means that there is a premium on supercharger efficiency from the point of view of power input for a certain air output in terms of volume and pressure. Air capacity and pressure ratios are also design characteristics of the supercharger and they must be suitable for the engine requirements. It is also necessary to correlate these characteristics with supercharger speed-since many engine applications have a varying speed requirement.

Thus, from a functional point of view, we have to consider volume-pressure-speed relationships and the ability to meet a given set of conditions within the design range with a minimum power input.

In addition, certain physical conditions must be satisfied. The unit must be as compact as possible and relatively light in weight. Ideally, it should be highly adaptable so as to permit application to the engine with a minimum of modification. Long service life is a prime requisite and implies the need of a high degree of reliability. Finally, costs must not be disproportionate.

Considering the ideal requirements, it is not surprising that there has been a number of designs developed, each representing someone's idea as to the best way to do the job. Now, let's get down to cases and consider the design and characteristics of one unit—the supercharger built by Miehle-Dexter—to see the approach to these various problems and the results.

Design Features

Miehle-Dexter's superchargers are of the positive displacement type having two intermeshing rotors, each having three straight lobes, enclosed in a housing. Air trapped between the lobes of each rotor is carried between them and the housing to the discharge side where it is forced out as the lobes mesh.

Aluminum is the principal material used in construction. Not only does this decrease the total weight of the unit, but it becomes increasingly important for rotor construction as speeds increase. The lower weight of the rotors reduces inertia forces thereby improving acceleration characteristics. The possibility of increasing rotative speeds safely permits a smaller unit to be used for a given air capacity as the latter bears a direct relationship to speed.

The casing is symmetrical, having identical inlet and outlet ports. This helps to facilitate application to an engine as it permits rotation in either direction. Endplates are doweled accurately to the ends of the casing. They provide precisely-located supports for the bearings of the rotor shafts.

An additional housing on the drive-end encloses the precision helical-type gears, pressed on the rotor shafts, that serve to drive both rotors and "time" them so as to prevent the intermeshing lobes from contact. It is also a pocket for lubrication.

These features promote mechanical efficiency. Others are intended to improve functional efficiency in order to achieve a high overall relationship of performance to power input.

In working with a medium as fluid as air, minimum clearances are important in achieving high volumetric and adiabatic efficiency. Two major points of loss are: leakage between the ends of the rotors and the endplates, and between the tips of the rotors and the housing. Expansion of the components with temperature increases makes very close clearances impractical and also poses severe machining and production problems.

By anchoring formica wear strips at the tips of the lobes, the lobe clearances are held to practically zero. To offset the other difficulty, a patented synthetic rubber-grid seal is vulcanized to the endplates by a special process. In addition to sealing, these prevent metal-to-metal contact.

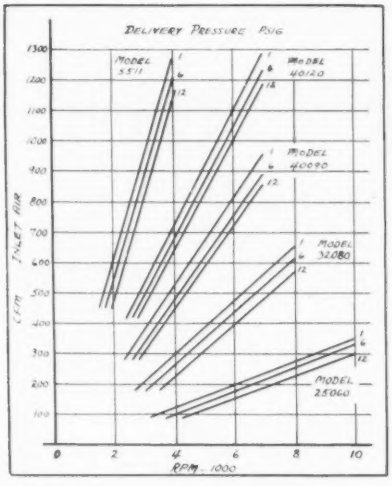
These features also tend to simplify machining of the components by allowing standardization of sizes. Hand fitting is eliminated. As a result, interchangeability of parts is greatly improved.

used and will not only supply scavenging air, but where the engine design as in the case of the uniflow engines permits inlet closing to be later than exhaust closing, pressure-charging is possible.

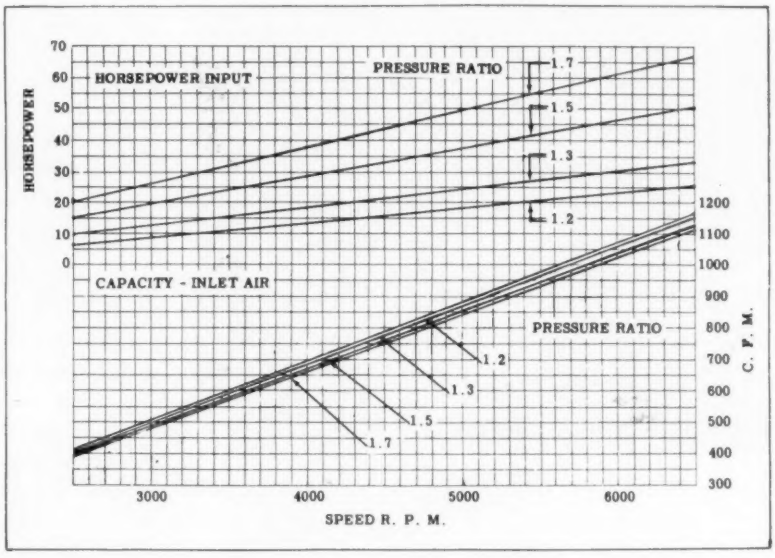
Getting back to 4-cycle units and one in particular, this engine, naturally aspirated, develops 215 hp at 2100 rpm. Its weight is 11.9 lb. per hp. Through application of the supercharger, 280 hp is available at the same speed and the weight per hp goes down to 9.55 lb. Such space and weight advantages cannot be shrugged off.

Field tests have shown that supercharging gives better general engine performance. Since the volume of air delivered is in proportion to the speed, greater acceleration and a greater reserve of power is reported.

With proper valve-overlap, the clearance space above the piston is scavenged, thereby providing more oxygen and lower temperature for the intake charge. Engine



Delivery capacities in cubic feet per minute for five different models plotted at three pressures.



Horsepower required and inlet air capacity for the Model 40120, plotted at four compression ratios and speeds ranging from 2500 to 6500 rpm.

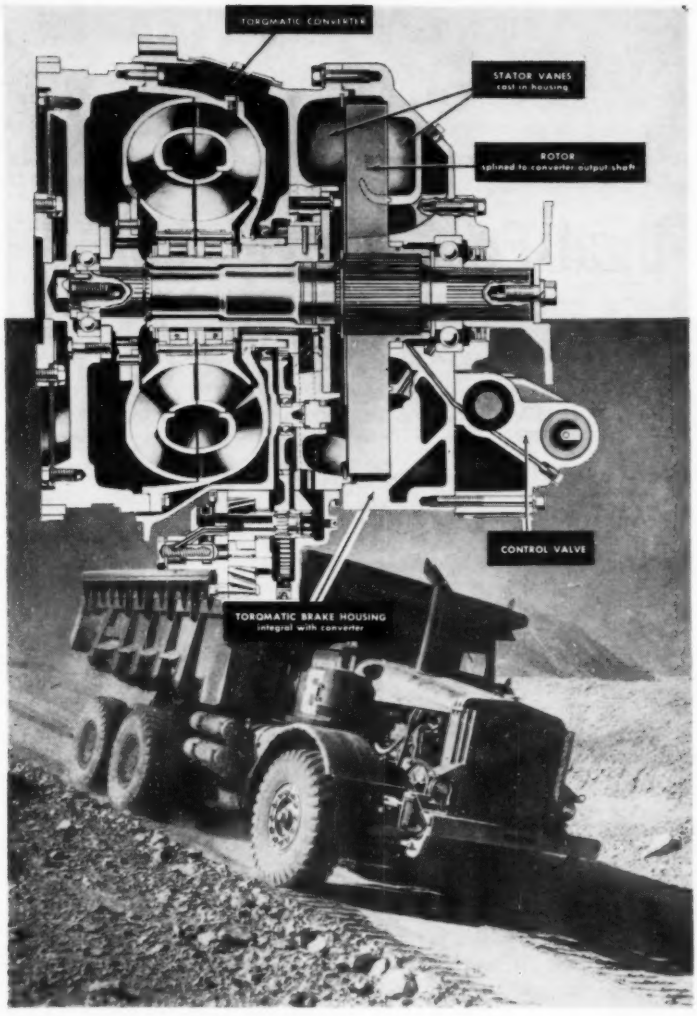
Results

The accompanying charts provide engineering information concering the different models and their performance. If you are engaged in engineering an application, they will give you a pretty good idea of what to expect. Perhaps an actual example will give a more visual realization of the results of supercharger application.

Before getting into supercharging and its advantages, it might be well to mention that these blowers are also used on 2-cycle engines. These engines, lacking the intake stroke of the 4-cycle type, always need some source of air supply. The mechanically-driven blower is widely

loading therefore is not increased appreciably for moderate supercharging. All in all, the advantages of the engine-supercharger combination are well established.

These same field tests have shown this particular supercharger to be simple, rugged, and dependable. If after a long period of service repairs are needed, the units are easy to rebuild and downtime is minimized. To further minimize the cost and inconvenience of downtime, particularly in cases of accident or extreme neglect, the unit can be factory-built on a flat rate basis and returned for more productive service with a rebuilt-unit guarantee.



Developed by the Allison Division of GM, the torqmatic brake is designed to provide positive control over the downhill speed of heavy-duty off-highway trucks without wear on conventional brakes.

Allison's Torqmatic Brake

KNOWN as the Torqmatic Brake, the new system is an added package to the Allison torque converter. It is not a friction brake and thus has no parts which burn up or wear out under heavy usage. Instead, it consists of three major parts: a rotor assembled as an integral part of the converter output shaft, the stator vanes cast into the housing which encloses the rotor, and a control valve.

How it Works

As the truck moves downhill, the operator opens a control valve which admits oil to the brake. The paddles of the rotor churn the oil against the stator vanes, thus placing a drag on the converter-transmission drive shaft. If more braking is required, more oil is admitted to the brake. Thus the operator has the truck under full control at all times and he need use the conventional friction brakes only to come to a complete stop.

On the downhill grade, the oil does all the braking work and also absorbs the heat generated by the braking action. The pumping action of the rotor circulates the oil to a heat exchanger where the heat is harmlessly dissipated. Source of the oil supply is the lubricating system for the converter and transmission, so after cooling, the oil is returned to the oil reservoir for re-use.

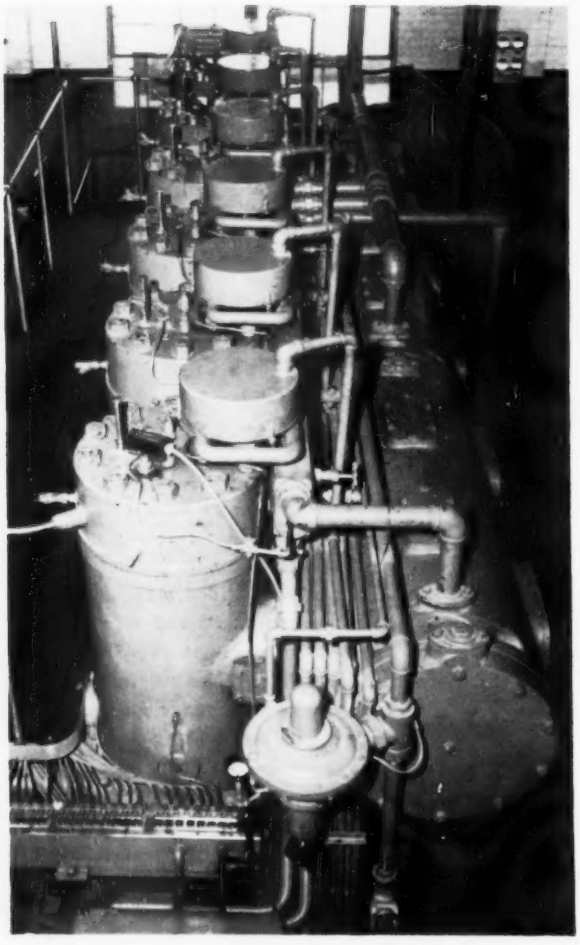
"Because it can move downhill under greater control and at higher speed, a truck equipped with Torqmatic Brake can make more trips per shift and return more income to the operator," it was pointed out by Mr. E. B. Newill, vice president of GM and general manager of Allison. "In addition, maintenance and replacement of linings on the conventional brakes are greatly reduced."

The brake has been undergoing a number of field service tests at various locations since August 1952, and recently has been put into commercial production. It can be specified on new trucks or field-installed on vehicles already equipped with Allison Torqmatic Drives.

During one of these field service tests, the brakes were installed in trucks in daily operation at a Utah copper mine. After being evaluated against trucks with only conventional brakes, it was found that a truck with Torqmatic Brake made 21 trips per shift on a seven per cent grade, while similar trucks without the Torqmatic Brake made 14 trips per shift.

F-M Model 32 Dual-Fuel Conversion

New conversion system extends the benefits of dual-fuel operation to users of F-M's Model 32 engines.



A view of the duel-fuel conversion equipment on a Fairbanks-Morse Model 32 engine at the Broken Bow Municipal power plant.

FOR many years, Fairbanks-Morse Model 32 diesel engines have been the work horse of a number of small and medium-sized diesel power plants. Their simple and rugged construction made them particularly attractive when it was necessary to use operators with limited training. There are no camshafts, driving gears, or engine valves with actuating equipment to require maintenance or delicate adjustment.

The advent of dual-fuel equipment for use of natural gas and the need for equipment larger than the capacity of the Model 32 were in many cases the only inducements strong enough to get other types of equipment installed in heretofore 100 per cent Model 32 plants. Fuel oil costs have increased greatly in recent years and is by far the largest expense in power generation. During this time, natural gas has become available over large areas of the country at low cost, in many cases no more than one-third that of fuel oil.

Dual-fuel engines have been installed and conversions made on many existing engines in order to lower fuel costs and hence generating costs. In many plants where larger dual-fuel engines were installed or engines suitable for conversion adapted, the Model 32's, for which previously no conversion was available, still operate as diesels and adversely affect the plant's overall fuel bill.

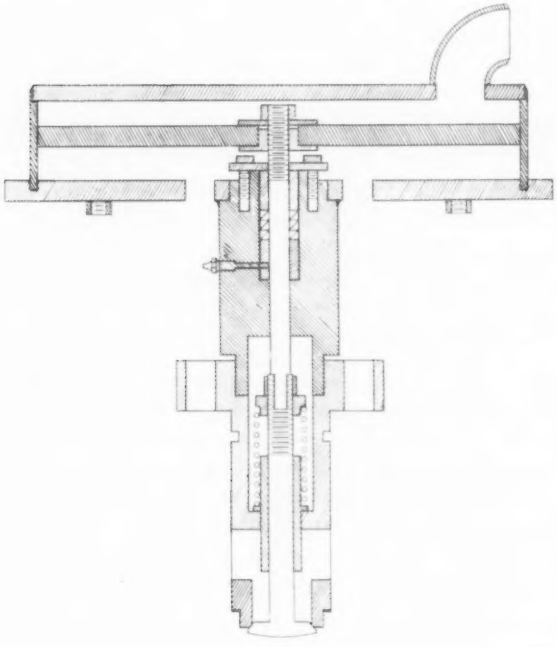
In this respect the simplicity of these engines has been somewhat of a drawback. Most 2-cycle dual-fuel systems on the market have timed cam-actuated gas admission valves as part of their equipment. Timing and motion are taken from some existing mechanism. Hydraulic systems are also used for actuating gas admission valves on some engines. These do a good job but are frequently expensive to install due to the amount of new equipment required.

Engineers have agreed for a number of years that a dual-fuel conversion of the Model 32 was possible. However, it was generally felt that due to the engine's original simplicity the additional equipment needed for

conversion would make its cost prohibitive. Mainly for this reason everyone has been reluctant to build such a conversion.

In view of the incentive, Mr. L. E. Clark, Superintendent of Broken Bow, Nebraska, Municipal Utilities, gave several years of consideration to the problem of a simple conversion to be applied to a simple engine. An engineer himself, he consulted with a number of other engineers well versed in dual-fuel developments before deciding to go ahead. The concept was that the system must match the engine in simplicity and be reasonable in price. The first installation was made in the Broken Bow Municipal Power Plant.

The conversion system developed uses timed low-pressure air obtained from the engine crankcases to operate actuating pistons and gas admission valves. The



A schematic of the gas admission valve which replaces the original starting air check valves when conversion is made.

gas valves are installed in the engine cylinder heads, replacing the original starting air check valves. They serve for admitting starting air as well as for gas admission.

Characterized by simplicity, there are no critical adjustments to get out of order. No auxiliary air pump is needed. Nearly all of the original equipment including the cylinder heads remain intact.

The conversion in no way affects the engine's operation on fuel oil and changeover from diesel to dual-fuel operation requires manipulation of a single lever. The original Woodward governor controls the engine when running as a diesel or as a dual-fuel unit. Governing of gas quantity is accomplished by varying the pressure in the gas manifold. If 900-Btu gas is used this pressure varies between 10 and 20 psi according to the engine loading.

Original economy figures showed that the engine consumed 11,200 Btu (gas) per kwh and 2800 Btu per kwh in pilot oil. Improvements intended to reduce these figures are in progress. The first conversion is being rebuilt to embody several new refinements including separate pilot oil injection pumps. It is expected that economies to be obtained for both gas and pilot oil will produce figures comparable to those of other dual-fuel installations.

Some safety features not found on some present gas admission systems are incorporated. A mechanical overspeed cutoff shuts off the gas supply in the event of governor failure or engine over-speeding from any other source. If a failure should occur in the actuating system the gas admission valves close. Every valve is closed when the engine is stopped. Thus, failure to close the gas supply valve does not endanger the engine as no gas can flow into the cylinders, crankcases or exhaust system.

Another test conversion is planned for installation in another plant before production models are made available. Installed costs, due to the simplicity of the system, are not expected to exceed one-half that of other comparable conversions.

This new system of conversion is adaptable to a number of other makes and models of diesel engines now in the field, both 2 and 4-cycle. Its use is especially attractive when installed on engines in the low and medium speed range. Its principles may very well be incorporated in the design and manufacture of new dual-fuel engines in the future.

Several manufacturers have indicated their interest in the manufacturing and distribution of this equipment. Also, some natural gas companies, interested in securing new loads for their systems, are cooperating closely. Several surveys are in progress to determine the probable extent of the market for conversions of existing engines after completion of which Mr. Clark indicates that manufacturing operations will probably be turned over to some reliable firm.

Mr. Clark carried on the development work under the name of "Clark Enterprises" and entirely at his own expense. Patent applications are pending. His inventiveness is evident in the Broken Bow plant. Larry as he is known to his friends is always proud to show you through the up-to-the-minute plant having three Fairbanks-Morse and two Enterprise units totaling 4910 hp. Several other pieces of equipment (evidence of his handy-work) serve to aid its economical operation. The economy and reliability of this diesel plant has kept it firmly entrenched in the face of stiff and aggressive competition.

Electrical Equipment Maintenance

Preventive maintenance, whether applied to mechanical or electrical equipment, is important if economical operation is to be obtained. Following are some useful pointers on electrical equipment maintenance.

By Richard W. Inman

Vice President, Associated Research, Inc.

YOUR doctor in giving an annual physical check-up, will usually refer to his records of your condition at the last check-up. In this periodic testing of blood pressure, tonsils, etc., he is actually performing preventive maintenance on your physical mechanisms to assure their continued proper functioning. Like the doctor, you as a maintenance man must also give the same degree of care to your electrical equipment and apparatus if it too is to continue to serve you well.

In recent years, industry has begun to realize the economies of preventive maintenance. The most effective means of performing this work is through thorough periodic testing to predict the start of equipment failure rather than wait until costly breakdowns occur.

For electrical equipment, the indicator, most generally used is the "condition" of the electrical insulation, expressed in terms of its megohms of resistance—the poorer its condition—the more likely an electrical breakdown.

It is hoped the following discussion will adequately present for you the more important aspects of periodic electrical insulation testing as a valuable maintenance tool.

Insulation and Its Enemies

The insulation covering your various electrical apparatus and wiring is, to the eye, inert. Its dielectric properties (resistance to electrical flow) are the reason for its use. Since good dielectric materials are generally good wearing materials, the problem of weakening or faulty insulation may well be overlooked until valuable equipment or critical wiring systems fail in use.

STRESSES—Actually, electrical insulation is subject to severe stresses, even under normal operating conditions. These stresses, which cause progressive weakening of insulation value, are caused by heat, dirt, moisture, vibration, wear, aging, and even by light.

During an *ON-OFF* operation cycle of a motor for instance, insulation is subjected to a wide range of temperatures by the heating and cooling of the motor. The mechanical strains thus set up in the insulation can eventually result in breaks which cause direct short circuits or serious power losses.

DIRT—One of the greatest enemies on insulation is dirt, because almost all casually collected dust, lint, airborne grease, etc is an excellent conductor and capable of penetrating minute cracks and faults in insulation.

Keeping electrical equipment clean is thus a primary rule of preventive maintenance—and insulation resistance testing is the best means of detecting hidden dirt causing insulation deterioration.

DAMPNESS—Electrical equipment operating in a damp atmosphere requires added maintenance attention. The rising temperature of a starting motor for instance, allows the air around it to absorb more moisture. Part of this moisture is absorbed by the insulation in the windings. On cooling, some of this moisture condenses on the insulation, and aids the expansion-contraction effects in deteriorating the insulation.

Even a humid day creates this effect, lowering the insulation resistance of all electrical equipment. Flooding or other accidental immersion of electrical apparatus will however, call for special treatment in drying and cleaning.

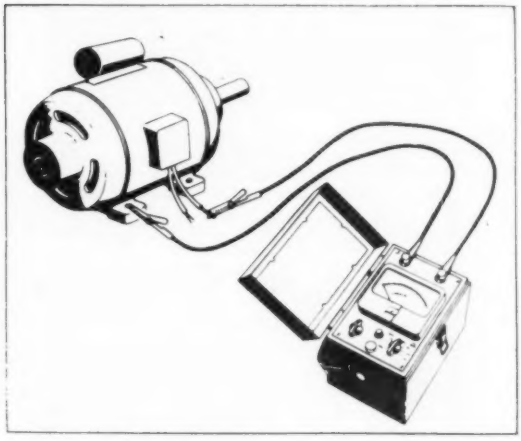
VIBRATION—This is an ever present hazard wherever there is operating machinery, steam lines, or even heavy pedestrian traffic. Insulation is subject to the same results from vibration as the old automobile that actually "shook itself to pieces".

WEAR—Aging and light deterioration are generally less severe than damage caused by dirt, water, heat and vibration . . . And all of them operate relatively slowly, but nonetheless surely in damaging insulation.

Because of these natural "enemies" of insulation, periodic checks with an insulation resistance testing instrument will almost invariably predict breakdown or dangerous weakening of any part of your electrical

Illustrated at left is the Vibrotest, an electrical insulation resistance tester.

The method for testing insulation resistance on alternating current motors is shown directly below.



equipment or system. As the effects of these "enemies" become greater, the resistance in megohms of the insulation decreases in value—eventually resulting in a short circuit unless found and the cause checked.

The "Vibrotest"

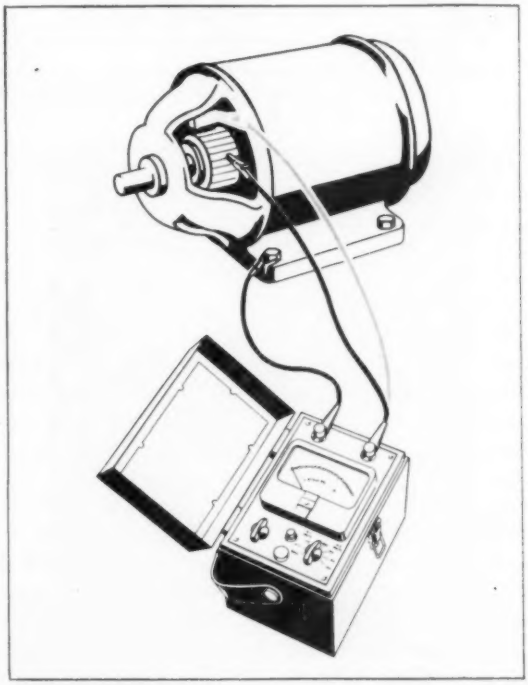
One of the more convenient instruments available for this testing purpose is one allowing, in addition to the megohm insulation resistance range, a circuit checking ohm scale and AC and DC voltage measuring scales: These additional scales prove invaluable in tracing trouble and in measuring circuit voltage of equipment being tested.

All too frequently circuits about to be tested for insulation resistance, while presumed to be dead, are actually charged with operating voltages. In addition to being a hazard to the maintenance man, such conditions frequently damage the testing instrument. These operating voltages on diesel-electric equipment often reach 1200 volts and in addition, various voltages to ground are frequently encountered.

Thus, by combining voltmeter ranges with the megohm and the ohm ranges in one test instrument, and so arranged that only one set of connections need be made, it becomes rather a simple matter to check for possible voltages and then check the insulation resistance, *after the voltage is removed from the equipment.*

This instrument employes a battery-powered synchronous vibrator power supply which is push-button actuated. The testing potential of such instruments, while normally 500 volts DC, does vary with some ranges of insulation resistance.

The megohm range gives a direct reading of the millions of ohms of resistance which any electrical insulation offers to the passage of current. Actually, even good insulation does allow current to pass, if only on the order of 0.000001 ampere, or less, per 500 volts of impressed potential. It is this passage of a minute current through insulation that causes the insulation tester to indicate.



An illustration of the method of testing direct current motors.

During the resistance test, the insulation path being tested (between the instrument leads) is subjected to a potential of 125 to 1000 volts DC depending upon the range and type of test instrument being used. This voltage causes a current flow through the insulation and the indicating meter of the tester which is calibrated in megohms. Thus, you read actual resistance value as a result of the primary electrical formula: R=E/I.

PM Records

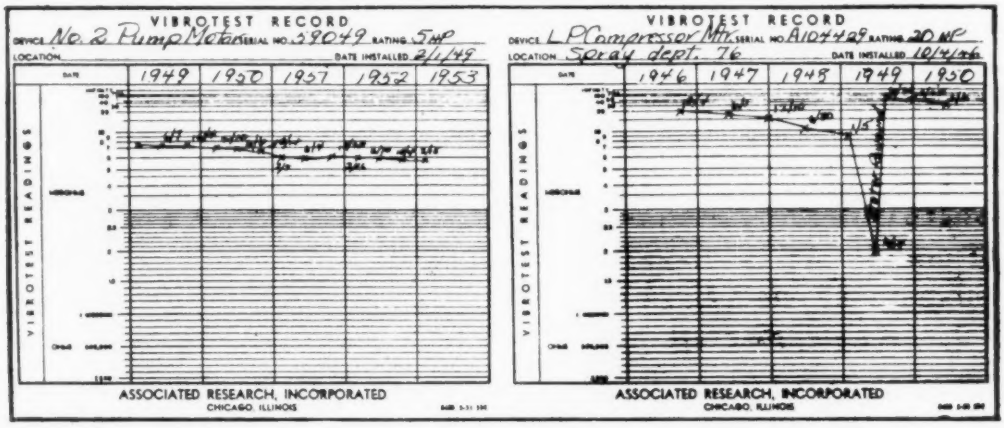
Unlike voltage, circuit resistance, or current flow, which can be determined positively at any given time with proper instruments, insulation resistance values which are "safe" for any piece of equipment vary greatly. Two motors, for example, of the same horsepower, same maker, and same age may have quite different insulation resistance values, yet both be in safe operating condition.

The record at the right however, tells the story of trouble with a happy ending. This motor was performing satisfactorily for the first two years, when a periodic check showed a sharp drop in insulation resistance to very close the danger line. Inspection showed a need for a new stator winding, and after it was installed, resistance values bounced back higher than the first reading taken.

These cards are but two examples of how to keep track of the condition of all types of electrical equipment and foresee trouble ahead in time to arrange for cleaning or repair without costly disruption of operations.

Figuring the "Safe Limit"

Now that we have discussed what insulation resistance is and the importance of properly and periodically testing it, just what is "*good*" insulation resistance? Safe insulation resistance in rotating machinery or other


VIBROTEST RECORD
DEVICE No. 2 Pump Motor SERIAL NO. 39049 RATING 5HP
LOCATION DATE INSTALLED 2/1/49
1949 1950 1951 1952 1953
VIBROTEST READINGS
ASSOCIATED RESEARCH, INCORPORATED
CHICAGO, ILLINOIS
VIBROTEST RECORD
DEVICE L P Compressor Mtr. SERIAL NO. A104429 RATING 20 HP
LOCATION Spray dept. 76 DATE INSTALLED 10/4/46
1946 1947 1948 1949 1950
VIBROTEST READINGS
ASSOCIATED RESEARCH, INCORPORATED
CHICAGO, ILLINOIS

Here, we see a comparison of two motors, the one at left aging normally and the one at right, trouble with a happy ending. These cards illustrate the value of maintenance records.

Therefore, insulation resistance tests can do the best preventive maintenance job only if accurate records are kept on each piece of equipment tested; and if tests are made at uniform intervals under similar conditions of operation, temperature and humidity.

True, this may sound complicated at the first as well as time consuming—but the *few minutes* involved in the measurement and recording of the resistance are minor compared with the saving in maintenance time should troubles go undetected until an unexpected breakdown occurs. An illustration of the value of insulation resistance test records is shown.

The record at the left tells the continued story of a hardworking motor that is aging normally. Note that the first reading of 7.5 megohms was taken when the motor was installed new. Later readings, taken at approximately equal intervals of four months, show a gradual, expected decrease in insulation resistance; but with no sudden drops that would indicate trouble in the offing.

equipment may be regarded as that which is high enough to permit the equipment to operate normally without excessive current consumption or heating.

This is the simplest, most obvious rule to follow if you do not care to go into formulas which may be applied to electrical apparatus to get close approximation of what insulation should be for safe operation. Generally speaking, you can consider any insulation satisfactory in industrial equipment and circuits operating at 1000 volts or less if its resistance exceeds one megohm at normal operating temperatures and humidities.

Carrying this safe minimum of one megohms per 1000 volts a bit further, you may figure safe minimums for apparatus operating in excess of 1000 volts by simply adding one megohm to the safe minimum for every 1000 volts or fraction thereof. For example, if you have equipment operating at 2500 volts, 2.5 to 3.0 megohms minimum resistance readings should be satisfactory. If your initial insulation resistance readings fall below this "rule-of-thumb" minimum, equipment should be taken

out of service, inspected carefully, and necessary cleaning or repairs made to bring resistance values over the minimum reading required.

At times insulation develops a weak spot, which under full working load and voltage may have a tendency to cause serious internal current leakage or actual insulation breakdown. If the test voltage applied in making insulation resistance tests where this weakness exists too far below the actual working voltage, there is a possibility that the test reading will appear satisfactory when it actually is not.

Therefore where you find it necessary to test equipment which normally operates at voltages exceeding the instrument test voltage, it is well to increase the minimum value of acceptable resistance 1.5 to 2.0 times that of equipment operating at voltages lower than the test voltage.

Testing

When beginning insulation resistance testing, every *unit* of current carrying apparatus should be tested and a record card made of the resistance reading. A circuit composed of a switch, wiring from switch to motor and a motor would be divided into two units. The first unit would consist of the switch and wiring to the motor while the second unit would consist of the motor alone.

Keep your test units as simple as possible, so you can locate trouble quickly. The extra effort necessary to disconnect various sections of grouped equipment for testing will be well repaid when weakened insulation shows up in a unit after only two or three tracing tests to pin down the source of trouble.

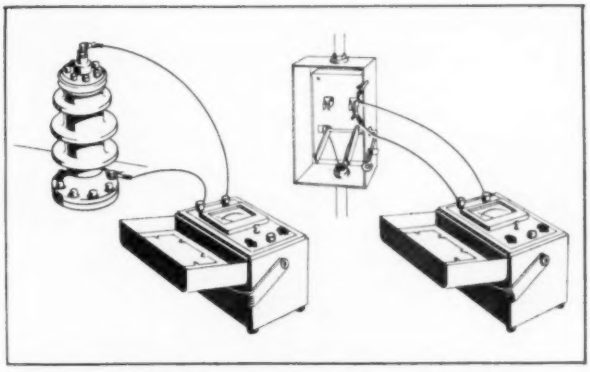
Generally, working electrical equipment, such as motors, generators, transformers, heating elements, relays, etc., is almost invariably more likely to develop insulation failure than wiring, insulators and other non-moving, non-cycling electrical apparatus. Therefore, your schedule of periodic insulation resistance tests should include more frequent testing of working equipment. Four to six months between tests is generally considered the safe maximum.

Some maintenance departments however, check all rotating machines every three months, while in other cases, motors operating in dirty or moist atmospheres require a monthly check. Tests of wiring and like apparatus are usually adequate on a yearly basis unless working conditions are particularly bad.

Summing Up

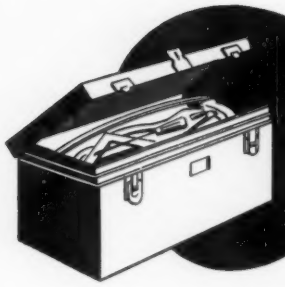
In conclusion, we hope we have convincingly shown that to obtain the longest possible useful life from your electrical equipment, it must be given adequate maintenance in the form of periodic insulation resistance tests. Choice of a good insulation tester and employment of an adequate testing program including records for each important piece of machinery will surely effect a boost in operating efficiency and relieve the headaches of a sudden *un-expected* equipment breakdown.

Above, a Vibrotest is being used to check the insulation resistance of electrical circuits on a diesel-electric locomotive.



Method of testing insulators and switchers.

Here, network testing is the job. In any case records of previous tests are important if sudden failures are to be prevented.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

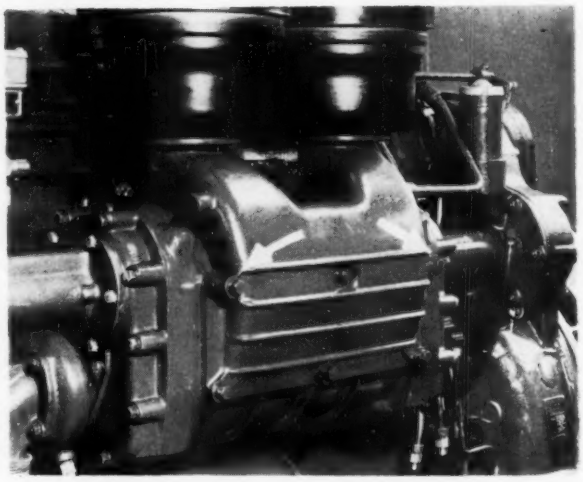
Guide Pins for Blower Mounting

CLYDE GREGOR, FORT BRAGG, CALIFORNIA—Here is a contribution to your "Tool Box" column that you might want to pass along. It is an easy method of installing air horns on a GM 671 engine blower.

I cut the heads from two 3/8-in x 1½-in standard thread bolts. The cut ends were then slotted to take a screw driver. The sharp edge around the bolt was rounded off by grinding.

The bolts are then screwed into the two top outside holes in the mounting flange on the blower. The spacer gasket and screen can be placed in their proper position, supported by the bolts. One man can then easily install the air horns using the bolts as dowels for both support and alignment.

When the remaining bolts are snugged in place, the guide bolts can be unscrewed with a screw driver. The regular bolts are put in place, the whole thing properly tightened, and the job is done.



Arrows point to particular bolt locations discussed.

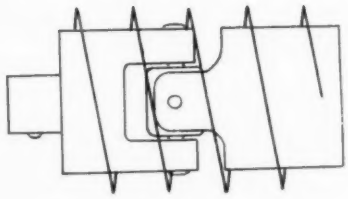
This looks like a simple and effective extension of the use of guide pins to this particular job. We'll bet that the fellows who normally uee them for making up a bell housing, for instance, never thought of this application. Why wouldn't this idea, using longer bolts, be a help in mounting the blower to the block as well? It would give safer support than simply hanging the blower lip on the block while trying to start a few bolts in the threads—Editor.

Stiffening Loose Universals

B. L. MCLENDON, LAMAR STATE COLLEGE OF TECHNOLOGY, BEAUMONT, TEXAS—Ever try to reach a hard-to-get-at-nut with a socket wrench set-up in which was a loose universal? If you have, you know the aggravation of trying to get the socket on the nut.

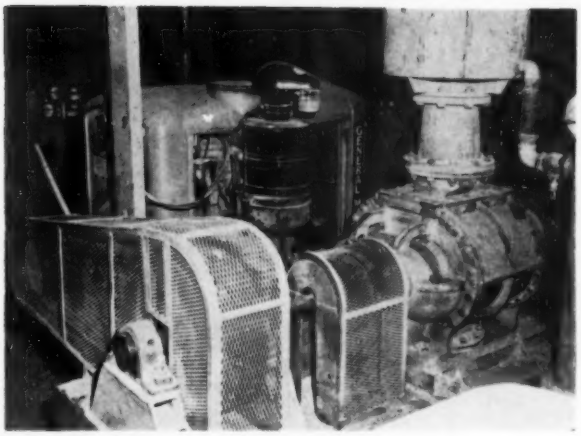
Here in the diesel engine course, the students worked out a simpler answer. All that you have to do is slip a light spring over the universal to make it less flexible. A piece of an old window shade spring will do the job nicely.

Mr. McLendon, instructor at the college, sent along two idecs on behalf of his students. The other was a design



for a simple fixture to hold GM Series "71" engine liners in place when the engine is turned over with the head off. Only trouble is that it's a dead ringer for the standard GM tool. No less credit to Mr. McLendon's boys, but GM had it first—Editor.

news of our industry



Diesel-Powered Airveyor

According to Detroit Diesel Engine Division of General Motors, the Southern States Cooperative, grain marketers of Baltimore, Maryland, are now using diesel power to advantage in transferring grain from boats to railroad cars. The operation calls for prompt unloading of boats when they arrive at the docks and the use of diesel power in stop-and-go service. Refinements in design, which have made diesels as easy to start as automobile engines, have been responsible for their profitable, present-day use in a growing number of applications where intermittent operation is encountered.

Here, a GM Series "71" engine was installed in a Fuller Airveyor system and now as boats arrive, the transferring operation is started by diesel power at the push of a button. The airveyor system is comprised of a Roots-type exhauster or suction pump, the diesel engine which drives it, and the necessary 6-in piping running from the dock to the cars. Sufficient vacuum is created by the exhauster to draw as much as 600 bushels of grain an hour from a ship's hold.

New Kenworth Rig

A new type of truck with cab-beside-engine design and practically unlimited driver visibility will soon make its appearance on American highways, according to John G. Holmstrom, vice president and general manager of the Kenworth Motor Truck Corporation of Seattle, which designed the new truck and has produced pilot models.

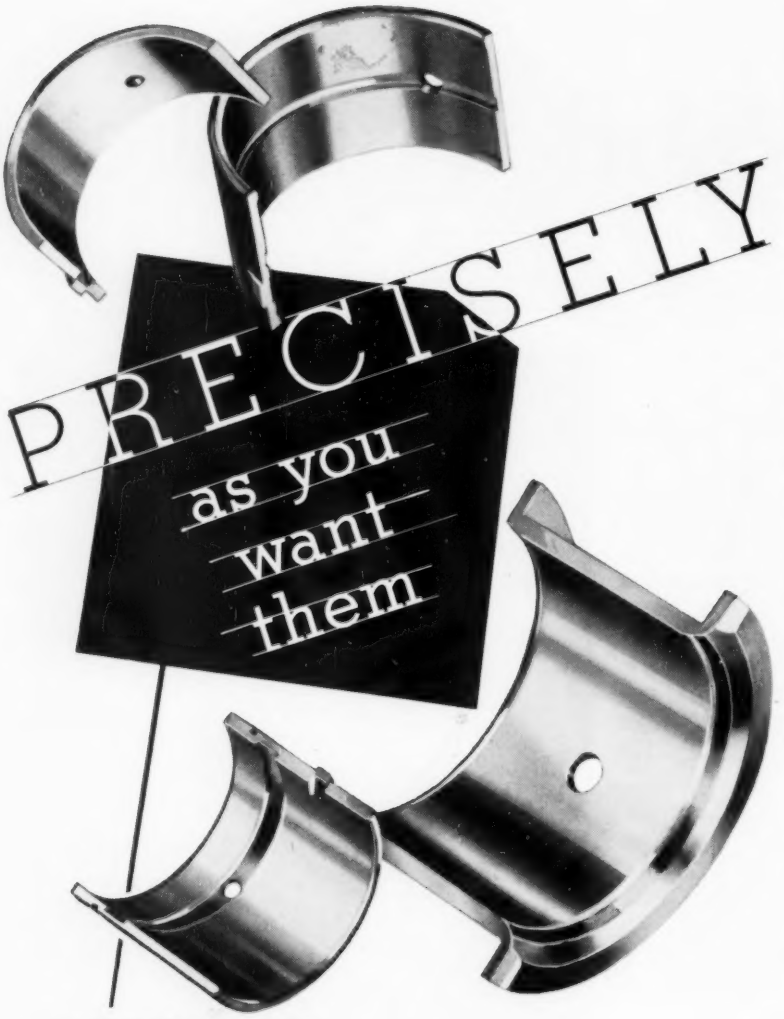
"The cab-beside-engine design is a new development in highway trucking and a complete break with tradition," Holmstrom said. According to Robert C. Norris, Kenworth's chief engineer, the need for maximum driver visibility dictated this design. Norris cited the fact that the driver of the new truck can see the head of a man standing in any position next to the cab. Corner posts were made as narrow as possible and the left rearview mirror is placed low to eliminate a blind spot.

Other advantages include reduced weight, due largely to the all-aluminum welded construction. Simplicity of design, added strength, easier access to the engine, lower maintenance and repair costs, and more comfortable riding qualities are also featured, according to Holmstrom.

new products . . . . . page 56

new literature . . . . . page 60

organizational news . . . . . page 64



JOHNSON BEARINGS Precision made . . . precision checked . . . Johnson Sleeve Bearings for diesel applications. Precision is not presumed at Johnson Bronze. It is checked and rechecked to the tolerances you require. This is one of the reasons why Johnson Sleeve Bearings have become so widely specified by diesel manufacturers.

JOHNSON BRONZE COMPANY
470 South Mill St., New Castle, Pennsylvania

WRITE FOR INFORMATION

news of our industry

Fram Buys Warner Lewis

The purchase of the Warner Lewis Co. has been announced by Steven B. Wilson, chairman of the board and president of Fram Corp. Terms of the agreement were not disclosed. The new acquisition will be known as the Warner Lewis Co., division of Fram Corp., and will continue at its Tulsa, Okla. headquarters.

The purchase adds another wholly-owned manufacturing subsidiary to Fram's others: Mason Can Co., Fram Florida, Inc., and Fram Canada, Ltd. The Liquid Separator Div., located at Richmond, Va., will be transferred to Warner Lewis within the next few months. In addition to handling liquid separator manufacturing and sales, the new division will also produce and sell the Fram line of industrial filters. Fram filters are also being produced in England, France, West Germany, Italy, South Africa, Argentina, Brazil, and Australia.

Peak Diesel Order for U.P.

What is described as the placement of the largest single diesel locomotive order ever given one firm by a railroad was announced by the Union Pacific with an order from the Electro-Motive Div. of General Motors for 205 units at a cost of $35,769,410.

Comprising 190 freight and 15 passenger locomotives, the freight order alone is said to represent a total hp of 332,500 and is theoretically capable of pulling a 60-mile long train of 6270 cars. Upon completion of delivery, expected by June, 1954, the railroad's main line between Omaha and the Pacific Coast will be completely dieselized for through traffic.

Brazil Orders Diesel Buses

ACF-Brill Motors Co. has just shipped an order for 20, 41-passenger diesel motor coaches to the Empresa de Onibus Passaro Marron, S. A., a Brazilian bus line. The new customer will use the Model IC-41A coaches on its regularly scheduled 272-mile run between Sao Paulo and Rio de Janeiro.

news of our industry

Nife Batteries to Indonesia

Nife Inc., Copiague, L. I., announces it has completed delivery of 30 diesel starting batteries of nickel cadmium type to the Indonesian State Railroad for passenger and freight locomotives. The batteries, manufactured for 1600-hp GE locomotives, are said to have extremely low internal resistance. Each battery consists of 48 cells, 64-v system, and has a capacity of 280 amp hr at the 2-hr discharge rate.

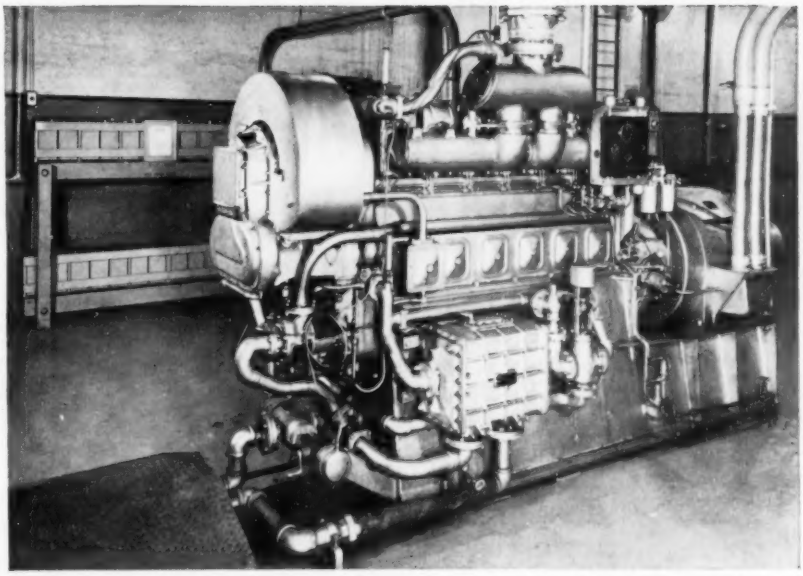
Bamfords Distributor Named

International Selling Corp., New York, has been appointed exclusive distributor of the Bamfords slow-speed diesel engines in the United States, Canada, and Mexico. Plans are being made by the company for extensive territorial distribution utilizing established diesel sales and service agencies throughout the North American countries. This appointment makes possible for the first time in these countries the availability and servicing of the Bamfords units. The complete line of the slow-speed diesels range from 3½ to 16 bhp at 600 to 700 rpm.

Harvester Contracts Heil

International Harvester Co., in its program to round out a full line of equipment in the industrial power and earthmoving industry, has come to an agreement with the Heil Co. which will enable it to manufacture 2-wheel rubber-tired industrial tractors used in heavy construction work. The arrangement, covered by a contract, gives Harvester the Heil patents on the tractors and also design and manufacturing data.

Under the agreement, Heil will supply the company with 2-wheel tractors for an interim period until it begins the manufacture of tractors, and will also manufacture certain types of scrapers and wagons for Harvester during the agreement period which will continue for a number of years. Two models are currently being built by Heil. They have been marketed as "Heiliners" and will now be sold under Harvester's trade name, "International".



Engine starting by Nicad Battery is certain, fast and trouble-free. Nicad's chief characteristics are long life and low maintenance.

Positive diesel starting?

. . . that's a job for Nicad

After all, starting a diesel engine takes power and plenty of it. It calls for a battery of special characteristics.

Long preferred in Europe for the vital services, the nickel cadmium battery is made in this country by Nicad — and is available for the special demands of diesel starting. Nicad's inherent characteristics are custom-grooved to this service.

Nicad battery construction is steel throughout, its alkaline electrolyte is a preservative of steel — and it is equally rugged chemically and electrically. It uses standard charging equipment and has negligible water consumption. This all adds up to low over-all costs. Want to investigate? Data available.

The Battery with the Steel Constitution

Send this coupon for information on Nicad

NICKEL CADMIUM BATTERY CORPORATION
Box 470, Easthampton, Mass.

Please send me authoritative data on Nicad Batteries. We are interested in the fields checked below.

☐ Signal Service ☐ Stationary Diesel Starting ☐ Diesel Switcher Starting ☐ Telephone Service ☐ Switchgear Operation ☐ Crossing Gates ☐ Track Circuits ☐ Car Retarding ☐ Emergency Light and Power

Name .....
Function .....
Company .....
No. and St. .....
City .....Zone.....State .....

new products

Water Separator and Fuel Filter

A new patented filter designed to remove 100 per cent of the water from diesel and other fuels is being introduced by the Fram Corporation, Providence 16, R. I. Fram has thoroughly field tested the new filter for more than a year before adding it to the company's complete line of primary and secondary fuel filters.

The cutaway drawing shows how the unit operates.

A. Fuel enters filter inlet.

B. Rust and solids are filtered out in one pass down to 1 micron (.000039 in) in size.

C. Water is brought together, forming large droplets.

D. Fuel and water droplets pass up center tube and out of fuel filter.

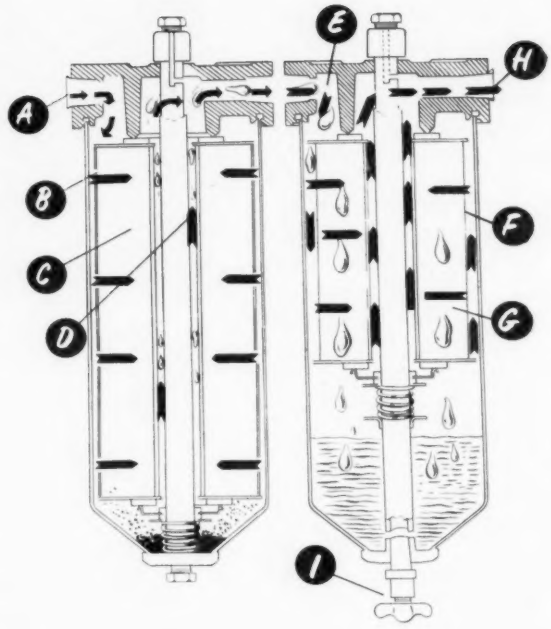
E. Fuel and water droplets enter separator filter.

F. Water collects on outside surface of separator cartridge and then drops into sump.

G. Fuel then passes through separator cartridge.

H. Clean filtered fuel, completely free of water, leaves.

I. A drain cock is provided for easy water removal.



Tune-Up Kit for GM Diesels

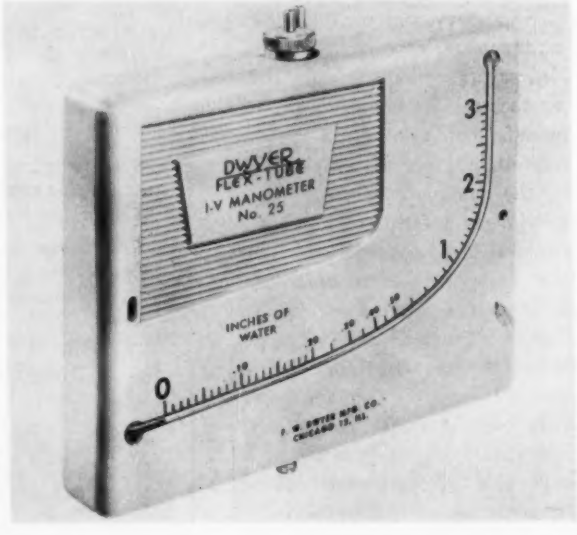
Kent-Moore has recently announced a new tune-up kit for GM Series "71" engines. The kit contains all the tools required to perform an accurate tune-up job in accordance with factory specifications. Further information may be obtained from the Kent-Moore Organization, 5-105 General Motors Building, Detroit 2, Michigan.

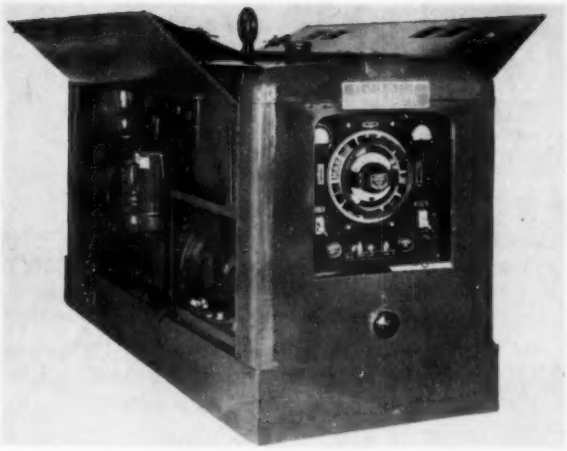
Flex-Tube I-V Gauge

A versatile gauge for plus, minus, and differential readings has been announced by the F. W. Dwyer Manufacturing Company. Housed in an attractive, rugged molded plastic case, the manometer has been designed to function as an air filter gauge, static pressure indicator, draft gauge, air velocity meter, etc.

One model is available with a range of zero to three inches of water, while a second model has a range of zero to seven inches of water. Low range accuracy for either model is .01 in water.

In addition, the I-V gauges are available in a direct-reading velocity model for use with a pilot tube and with ranges of zero to 7000 fpm and zero to 10,500 fpm. Further detailed information available from the F. W. Dwyer Manufacturing Company at 317 South Western Ave., Chicago 12, Illinois.





Diesel-Driven Welder

Powered by a Model 2055 GM 2-cycle unit injection diesel is this Hobart arc welder of 300-amp capacity. Designed for locations where electric power is unavailable, the welder is also equipped with patented "Multi-Range" dual and remote control so that fine voltage-ampere adjustments are possible right at the work. One thousand combinations permit correct arc intensity for any job. Engine has a 141.3-cu in piston displacement and is rated 67 hp at 1500 rpm. For further details, contact Hobart Bros. Co., Dept. DW, Hobart Sq., Troy, Ohio.

Diesel-Powered Mine Truck

This new Scoot-Crete, designed for safety in underground bulk material handling, is being marketed by Getman Brothers, South Haven, Mich. Of 3000-lb capacity, identified Model HDS-52, the unit is diesel powered for increased mine safety since proportion of carbon monoxide in exhaust is greatly reduced and diesel fuel is less inflammable than gasoline. An accessory scrubber is also obtainable for reconditioning exhaust gases. Caster steering allows truck to turn its full 100-in length. Truck is 43-in wide; operator's head is about 68-in above floor level. Operating speeds range from 1 to 15 mph through standard truck transmission.

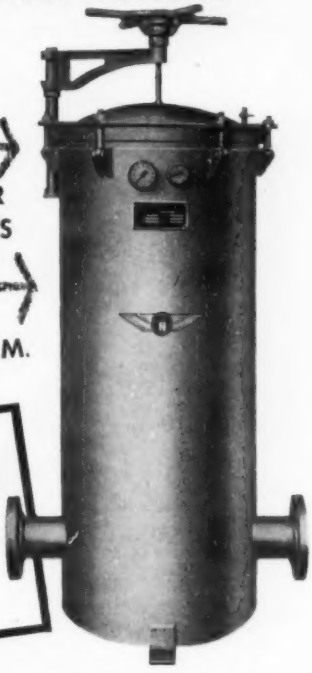
Now you get FULL PROTECTION at FULL-FLOW RATES!

NEW EXCLUSIVE CARTRIDGE

UNIQUE QUICK-OPEN COVER CHANGE CARTRIDGES IN ⅓ THE TIME

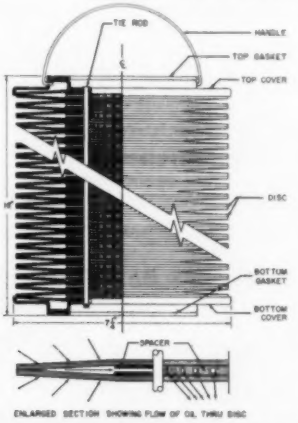
TEN SIZES from 25 to 900 G.P.M. with

HOFFMAN FLOmaster FILTER



Only full-flow filtration that keeps your lube lines clear of the smallest abrasives can fully protect bearing surfaces from serious damage. Only Hoffman Flomaster gives you these exclusive features assuring that protection:

- **Removes particles from 20 down to 5 microns at full-flow rates!**
- **Only 5 psi initial pressure drop with 150 S.S.U. oil!**
- **Inlet and outlet connections permit in-line installation on existing piping!**



ENLARGED SECTION SHOWING FLOW OF OIL THRU DISC

EXTRA LARGE FILTERING AREA IN EXCLUSIVE FLOmaster CARTRIDGE!

7x18 throwaway cartridge gives you large filtering area, providing 25 g.p.m. flow rate with 150 S.S.U. oil—a feature unequalled by any other cartridge of its size. Higher dirt-holding capacity means longer cartridge life for full-flow performance . . . *Filter media will not remove additives.*

Write for New FLOmaster Bulletin A-952

Hoffman

INDUSTRIAL FILTRATION EQUIPMENT & SERVICE

U. S.: HOFFMAN MACHINERY CORP., 251 LAMSON STREET, SYRACUSE 6, N. Y.

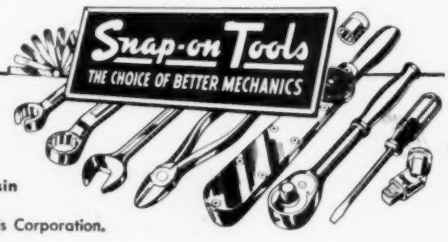
In Canada: Canadian Hoffman Machinery Co., Ltd., Newmarket, Ont.

Snap-on* MASTER GENERAL SET ½" SQUARE DRIVE

SET 368A-M-B

—covers widest range of wrench operations

By far the widest range of nut turning operations, in both production and maintenance, are covered with this Master Wrench set—½" drive, wrench sizes from ⅜" to 1¼". With this set your men have at their finger tips every combination of handle, adaptor, extension and socket to speed any job in this wrench size. On job after job you get the pay-off of Snap-on's superior speed, flexibility, durability. The sturdy Mechanikit chest has tote-tray and drawers for orderly tool arrangement and safekeeping. Available through your nearby Snap-on branch. For Snap-on industrial catalog and 104-page general catalog of hand and bench tools, write—



SNAP-ON TOOLS CORPORATION

8064-B 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

new products

Thread Repair Kit

Heli-Coil Corp., 1476 Shelter Rock Lane, Danbury, Conn., is making available thread repair kit No. 34CS, containing an assortment of 25 inserts in each of four commonly used sizes. All tools necessary for the wire insert method of thread repair are included: four taps, four inserting tools, and one insert extractor. Larger kits, it is announced, will be offered in the near future.

Automatic Turret Lathe

A high-powered automatic turret lathe, Model 4U, designed primarily for rapid removal of metal with modern carbide tools, is being produced by Potter & Johnston Co., Pawtucket, R. I., subsidiary of Pratt & Whitney. The following attachments can be applied on the unit: slow spindle speed for drill head pickup; slow spindle speed for spindle positioning; reversing spindle for right or left hand threading with automatic tap withdrawal.

Vacuum-Grip Safety Tools

The Safety Tool Div. of Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis., announces production of newly designed handles for its safety tools, involving numerous conical impressions which cause a vacuum as the palm of the hand makes firm contact. The slipping problem is said to be minimized even with oily or greasy hands.

Another feature of the vacuum-grip is the prevention of excessive perspiration and thus the forming of blisters. As the grasp shifts in working, blood is permitted to nourish the skin in the palm of the hand, thereby preventing the formation of callouses. Handle is of seasoned hickory.

new products

Flexible Grinding Wheel

Merit Products, Inc., 4023 Irving Pl., Culver City, Cal., is introducing a new tool called Grind-O-Flex, a flexible grinding wheel consisting of hundreds of individual abrasive cloth leaves sealed to a hard core. As the wheel turns, it presents a continuous abrasive surface to metal parts.

The tool is designed to smooth surfaces and remove flaws from contours without danger of digging into the stock. It is 6½-in in diam, 1-in wide, and is available in a variety of grits from coarse to very fine. It may be used stationary or portably. No special setups or equipment are said to be necessary for application.

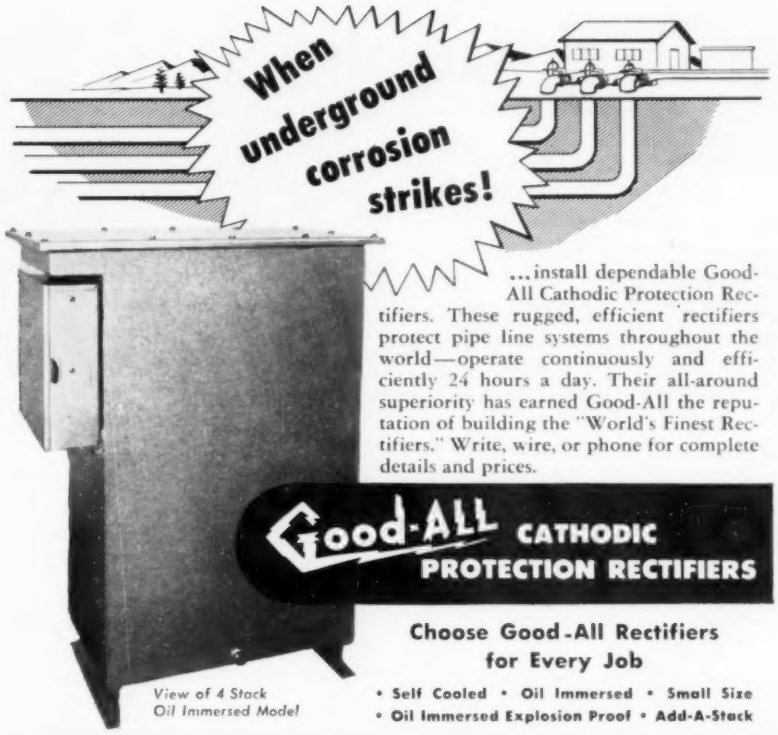
Packaged Abrasive Stones

Oil stones and dry stones for machine and tool purposes are being offered in packages by Random Abrasive Co., 449 Rockaway Rd., Dover, N. J. The stones are standard aluminum oxide and silicon carbide such as are commonly sold in larger sizes and are being offered in random lots. They are designated as Random-Thin-Stix and Random-Lap and come in packages sectionally divided as to grits.

Self-Locking Set Screw

Set-Screw & Mfg. Co., 190 Main St., Bartlett, Ill., is offering an improved self-locking set screw embodying a basic design change. The top thread of the screw has been removed so that the locking action is now confined to the uniform part of the tapping rather than acting at the top where variations are likely to occur.

An advantage of the new design is that the screw is more adaptable to a wide variety of tappings. In addition to the hexagon-type, it is available with fluted socket.


When underground corrosion strikes!
...install dependable Good-All Cathodic Protection Rectifiers. These rugged, efficient rectifiers protect pipe line systems throughout the world—operate continuously and efficiently 24 hours a day. Their all-around superiority has earned Good-All the reputation of building the "World's Finest Rectifiers." Write, wire, or phone for complete details and prices.
Good-ALL CATHODIC PROTECTION RECTIFIERS
View of 4 Stack Oil Immersed Model
Choose Good-All Rectifiers for Every Job
• Self Cooled • Oil Immersed • Small Size
• Oil Immersed Explosion Proof • Add-A-Stack
GOOD-ALL ELECTRIC MFG. CO • Ogallala, Nebraska

Diesel Men Specify STRATOFLEX
STRATOFLEX Precision Elbow Hose Fittings are designed and engineered to fill your requirements. Whatever your specifications in detachable reusable hose fittings, and flexible hose assemblies, specify STRATOFLEX!
PRECISION ELBOW HOSE FITTINGS
• AVAILABLE IN ALUMINUM OR STEEL
• ALL SIZES • ANY ANGLE OF BEND
• FLANGE & SWIVEL NUT CONNECTIONS
WRITE FOR COMPLETE INFORMATION
STRATOFLEX
STRATOFLEX INC.—FORT WORTH, TEXAS
P. O. BOX 10398
BRANCHES:
ATLANTA • CHICAGO • DAYTON • HOUSTON • KANSAS CITY
LOS ANGELES • MINNEAPOLIS • NEW YORK • ODESSA • TULSA
IN CANADA: STRATOFLEX OF CANADA, INC.—TORONTO 18, ONTARIO

new literature

Engine Power Costs Report

Twenty-five successive annual reports on oil and gas engine power costs is the achievement of the American Society of Mechanical Engineers, recently accomplished by publication of the 1953 report (data for 1952 and previous years).

For the first time in the history of these reports, the data are based on over one billion kilowatt-hours, specifically — 1,087,089,422 kwhr. Other vital statistics include data for 137 plants containing 557 engines rated 654,734 total bhp. This is more engines and more total horsepower than has been featured in any other previous report. Included in the report are 37 pages of tabulated data divided into three tables.

Table I is the plant cost table showing plant ownership, plant type, number of engines and total rated hp, total plant hours operated in reported period, total output in gross and net kwhr, load factors, average cost of fuel and lubricating oil in cents per gal, and costs per net kwhr in mills for fuel, lubrication, attendance, supplies, engine repairs, other repairs and total production costs.

The 137 plants break down in ownership as follows:

Municipal and/or water plants	69
Cooperatives	28
Privately owned	23
Industrial	8
Sewage disposal	6
Public district	3

Table II lists costs by years for plants reporting for successive years. It gives installed horsepower, net output, plant load factors, average cost of fuel in cents per gal (or mcf for gas), and operating cost as subdivided in Table I. Eighteen plants are reported on for 20 successive years; 34 for 10 successive years. Those who maintain that a diesel power plant will make a good record for one or two years, but that higher maintenance costs will get it in the long run, will find the answer here.

Table III gives detailed operating information. For each engine type, cycle, bore and stroke, cylinders, speed, rated bhp, year installed, the following data are given: hours operated, gross output, running capacity factor, peak load, bhp at rating and peak load, gal of fuel oil or mcf of gas, gal of lubricating oil, inspections on fuel used, details of cooling system, cost of engine repairs, major parts replaced, number and duration of enforced shutdowns, total scheduled maintenance time, number of plant attendants per shift.

Currently, there is much interest in the possibilities of burning cheaper fuel oils in engines. With Table III, it is possible to correlate the engine with the load, fuel, and maintenance cost. Each 52-page report may be obtained for $2.50 from the ASME, 29 W. 39th St., New York 18, N. Y.

BACHARACH NOZZLE TESTER for LARGE SIZE DIESEL NOZZLES

Check These Features

- Test Pump 1800 cu/mm capacity; ported design. Leak-proof—plunger is chrome steel, hardened, ground and lapped into pump body.
- Nozzle-holding Fixture has spring clamps that accommodate nozzles of different shank diameters. Nozzle is simply "snapped" into position between the clamps.
- Fuel Supply Reservoir (2.5 pint capacity) of durable, transparent plastic; fuel level can be easily observed.
- Micronic-type Filter is noted for its superior cleaning efficiency; is easily replaceable.

Get full particulars — Write for Leaflet 628

BACHARACH
INDUSTRIAL INSTRUMENT CO.
7301 PENN AVENUE • PITTSBURGH 8, PA.

LIQUID MATERIALS HANDLING
BLACKMER
PUMPS
1904-1954
50th Year

a story of growth

. . . to be continued

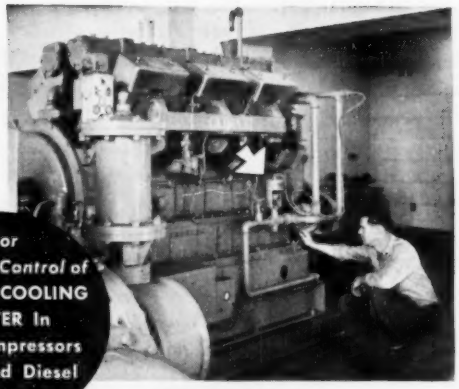
Blackmer's growth has been earned by the development and manufacture of products backed by 50 years of constant laboratory and field research. These products include industrial bulk pumps, truck pumps, hand pumps, strainers and fluid motors. Blackmer's advanced design, smooth operation, economy, and flexibility of use . . . have been performance proved throughout the last half century. Wherever liquids are handled, Blackmer pumps are known for quality, dependability and record durability. And now, new products soon to be announced promise a new standard of performance. Our engineers can solve your liquid materials handling problems . . . write for details today!

liquid materials handling

BLACKMER

Industrial Hand and Truck Pumps, Strainers, Pressure Control Valves
BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.
DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO
See Yellow pages for your local sales representative

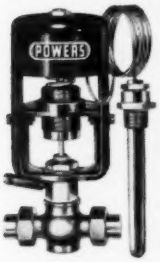
CLIMAX ENGINE at EVANSTON ILL. WATER WORKS



For Reliable Control of JACKET COOLING WATER In Air Compressors Gas and Diesel Engines

Use POWERS REGULATORS

No. 11 REGULATOR



Self-Operating Easy to Install

They Improve the Efficiency and Prolong the Life of Air Compressors, Gas and Diesel Engines.

For each compressor or engine there is a "best" temperature for the cooling water. To insure that temperature at all times, regardless of variations in load or seasonal changes in temperature of water supply, install Powers No. 11 automatic regulators. They reduce operating and maintenance cost. Write for Bull. RDIG. (b54)

THE POWERS REGULATOR CO.
Skokie, Ill. • Offices in over 50 Cities

Over 60 Years of Automatic Temperature and Humidity Control

YOUR OLD INJECTORS REBUILT EQUAL-TO-NEW

GM DIESEL POWER

Series 51-71-110 perfectly restored to original factory specifications by factory authorized source

IT'S GOT TO BE RIGHT IF IT COMES FROM GRIFFIN GUARANTEED

No reworked, no discarded parts unfit for further use. Through authorized source, you get finest workmanship, fresh-from-factory replacement parts of latest design and greatest efficiency. Investigate this money-saving plan to renew your old injectors.

AFI

Headquarters for G.M. Parts & Service

GRIFFIN EQUIPMENT CORP.
880 East 141st Street, New York 54
MElrose 5-7707

Pinion Setting Gauge Brochure

A 4-page illustrated brochure describing its pinion-setting gauge, designed to take the guesswork out of rear-axle overhauls, has been released by the Kent-Moore Organization, Inc., 5-105 General Motors Bldg., Detroit 2, Mich. The gauge is used to determine the depth of the pinion relative to the ring gear and is applicable both to bevel-gear and hypoid axles.

Exhaust Turbocharging

Under the auspices of the Franklin Institute of Pennsylvania, a monograph has been published which is essentially a summary of the many technical papers written by and about Dr. Alfred J. Buchi and his work. Entitled, "Exhaust Turbocharging of Internal Combustion Engines—Its Origin, Evolution, Present State of Development, and Future Potentials", the treatise covers the origin of the concept of exhaust turbocharging down to conclusions on the outlook for power-gas-generator-gas turbines.

A foreword is included by R. Tom Sawyer, manager, Research Dept., American Locomotive Co., which expresses the general admiration and respect of engineers and scientists throughout the world for the accomplishments of this versatile Swiss engineer.

Replete with pictures, graphs, charts and bibliographical footnotes, the 75-page book should prove invaluable to all concerned with the diesel engine. Dr. Buchi takes us through his entire career, citing his personal experiences in the development of improvements in the internal combustion engine, taking us on through the years in a step-by-step historical development.

In his conclusions, the author states that there are still many opportunities for further development, improvement, and utilization of the process of pure turbocharging, and expresses his opinion that it is quite worthwhile for progressive 2-cycle engine builders to begin to use exhaust turbocharging in conjunction with their power-engine products.

Considering the power-gas-generator - gas - turbine combination, he states that the outlook is most promising, citing various advantages. He predicts that this type of power unit will soon become a successful competitor of the "rather uneconomical gas turbine". A more forward-looking approach along these lines is therefore recommended in place of over-emphasis on pure rotary gas turbines.

ASTM Petroleum Standards

The latest edition of "ASTM Standards on Petroleum Products and Lubricants" provides 146 standards, including test methods, specification, and definitions of terms relating to petroleum.

A high percentage of the material included in earlier editions have been revised and 10 of the methods are new. A new section has been added, giving a summary of changes made in standards in 1953. Copies are available from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at $6 each.

new literature

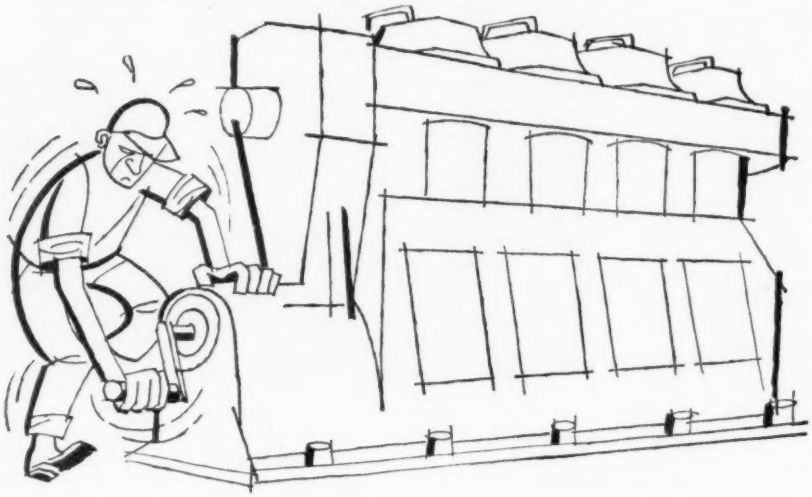
Transformer Buyer's Guide

The General Electric Co., Schenectady 5, N. Y., has issued its 1954 instrument transformer buyer's guide, designed to save electric generating plants time in the selection and ordering of current transformers, potential transformers, and metering outfits. Pertinent data is supplied, including prices, on all standard types. An index for replacement of obsolete types is included.

LPG Engines

The Fageol Products Div. of Twin Coach Co., Kent, Ohio, announces a new bulletin on its complete line of commercial LPG engines for operation on propane or butane fuels.

The 6-page bulletin covers horizontal and vertical models of the 404-, 451-, and 477-cu in engines. It is illustrated with photographs, cutaway and section views, horsepower and torque curves, dimensional drawings, and condensed specification data.



GET STARTED WITH AIR!

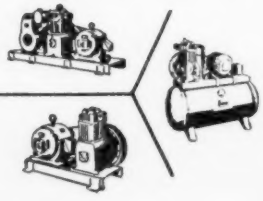
Fed up with the set-up? Give us the details. We will help you select from a variety of compressors, with sizes from 1 to 90 CFM.

Quincy Compressors are designed and built for *dependable operation.* When you select Quincy, you can be sure of compressed air when you need it.

Write Dept. J-35 for Form 400 describing modern . . . compact . . . rugged . . . and reliable Quincy Compressors.

YOU CAN DEPEND ON Quincy COMPRESSORS

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS



Branch Offices: New York • Philadelphia • Detroit • Chicago
Minneapolis • St. Louis • Dallas • San Francisco
Manufacturers of Air Compressors Exclusively

Truck Facts

The 1953 edition of "Motor Truck Facts" has recently been released by the Automobile Manufacturers Assn., New Center Bldg., Detroit 2, Mich. This 10th edition reflects the rapid growth of the industry. In spite of the record sale of new trucks since the war, there are more than 2,300,000 trucks over 10 years old, including 1,021,000 over 14 years.

Included among the numerous facts detailed by the booklet are those pertaining to our industry. There is an annual table for sales of trucks with diesel engines and for buses with diesel engines. Here the export market seems to be on the rise. Generally, South America appears to be the largest market. Diesel trucks over 19,500 lb sold almost two to one over the lighter weight.

Diesel trucks registered as of 1952, are listed by states. As a matter of comparison, there was a total registration of 55,740 for 1951 and 68,636 for 1952.

Ni-Vee Bronzes

The International Nickel Co., Inc., 67 Wall St., New York 5, N.Y., is presenting two bulletins concerning the Ni-Vee bronzes, a family of copper-base alloys pivoted around the presence of 5 per cent nickel and 5 per cent tin in varying amounts.

The bronzes are heat treatable for machine component pressure, and bearing castings are said to develop excellent mechanical properties in the as-cast condition. The bulletins describe a simple heat treatment to increase as-cast strengths as much as 30 to 60 per cent, culminating in the 90,000-psi range. Typical compositions and applications are given.

Flexible Tubing Applications

Pennsylvania Flexible Metallic Tubing Co., 72nd St. and Powers Lane, Philadelphia 42, Pa., has prepared an 8-page illustrated data book entitled "Flexineering"—the scientific application of flexible tubing.

Various products are catalogued and shown in application photographs. Complete engineering data on all tubing and couplings are contained.

Dependability...

proven on most diesel makes and models

MAKES **DETROIT** *Vernatherm* **Engine Thermostats . . .**

The *BEST* Choice For Your Needs

If you're concerned with the design of lubricating oil or cooling systems for jet, heavy-duty gasoline or diesel engines it will pay you to specify DETROIT Vernatherm Engine Thermostats. For only DETROIT Engine Thermostats give you the assurance of dependable, efficient operation performance proven on military and commercial aircraft . . . on ordnance combat vehicles . . . and on most diesel makes and models. So take advantage of this outstanding record—specify DETROIT Vernatherm Engine Thermostats, the true standard of the industry for rugged, exacting service! Available as engine cooling thermostats, oil cooler thermostats, shutter thermostats and thermostatic power elements.

All DETROIT Vernatherm Engine Thermostats are . . .

- *Designed to work with either open or closed cooling systems*
- *Built with tight seats for minimum leakage*
- *Not affected by barometric pressure*
- *Not subject to chatter*

ESTABLISHED IN 1877 AS DETROIT LUBRICATOR COMPANY

DETROIT-Controls CORP.

DETROIT 8, MICHIGAN Division of American Radiator & Standard Sanitary Corporation

Canadian Representatives in Montreal, Toronto, Winnipeg—Railway & Engineering Specialties, Ltd.

AUTOMATIC CONTROLS for REFRIGERATION

AIR CONDITIONING • DOMESTIC HEATING • AVIATION
TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER

CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

BIG NEWS

FOR ALL DIESELS!

FRAM completely removes water from diesel fuel with NEW WATER SEPARATOR & FUEL FILTER

✓**100% Water Removal!** ✓**Traps Dirt and Dust!**
✓**Cuts injector maintenance costs!**
✓**Reduces down-time!**

The new FRAM Water Separator & Fuel Filter is a double-action filter for complete injection system protection—

1. Saves costly injectors from corrosion, rusting and pitting . . . removes all water!
2. Micronic filtration traps dangerous dirt before it reaches injectors . . . ends abrasive action!

Save the cost of replacing expensive injectors! Guard your diesels for longer life . . . less wear . . . fewer repairs—with the new FRAM Water Separator & Fuel Filter! For specific installation information write: FRAM CORPORATION, Providence 16, R. I. Fram Canada Ltd., Stratford, Ont.

IMPORTANT!

Diesels already equipped with FRAM Fuel Filter need only the Water Separator Filter and a new FRAM Coalescer Cartridge for 100% water removal!

FRAM®
OIL • AIR • FUEL • WATER
FILTERS

organizational news

Kent-Moore Manager

Appointment of Marshall R. Chambers as general sales manager for Kent-Moore Organization, Inc., has been announced by D. R. Abbey, vice president in charge of sales.

Since joining the organization in 1947, Mr. Chambers has served as advertising manager and assistant general sales manager. In his new capacity, he will be responsible for the development of the company's newly inaugurated jobber sales program.

M. R. Chambers

Borg-Warner Engineering Head

A. R. Ficker has been appointed director of advanced engineering for the Rockford Clutch Div. of Borg-Warner Corp. He will investigate and develop new lines of products compatible with the division's manufacturing experience and facilities.

Mr. Ficker was recently associated with Chicago Midway Labs, division of Chicago University, as acting chief engineer and consulting engineer on a special Air Force project. Previous to that he was staff engineer at Willys-Overland Motors.

F-M Names Manager

Fairbanks, Morse & Co. announces the appointment of H. E. Hanson as manager of its St. Paul, Minn., branch house.

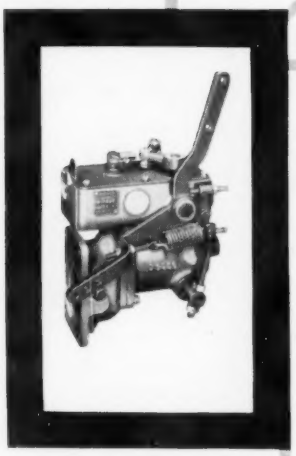
Mr. Hanson became associated with the organization in 1934 as a departmental assistant. He became a diesel field engineer in 1937 and in 1942, diesel department manager, which position he has held to date

H. E. Hanson

high in performance

low in cost

parts & service in the field



PIERCE GOVERNORS

for all Gas and Diesel Engines

Pierce centrifugal governors are your most dependable and efficient control mechanisms for industrial engines . . . from small generator sets to monster power units . . . gas (LPG), gasoline or diesel. For engines requiring extra power to position fuel rack or valve, the Pierce centrifugal with hydraulic booster (for original equipment only) is ideal! Replacement governors and parts are available through your local distributor or fuel injection service station.

For distributor's name or information on special governing problems, write

The PIERCE GOVERNOR Co.
INCORPORATED
1614 Ohio Avenue • Anderson, Indiana

PIERCE

"SPECIFY PIERCE CENTRIFUGAL GOVERNORS ON YOUR ENGINES"

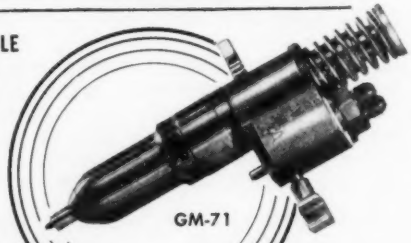
G&K DIESEL SERVICE

Offers at LARGE SAVINGS

INTERCHANGEABLE
FACTORY NEW
FIELD TESTED
PROVEN

WORLD FAMOUS "FERA"

Imported From Italy

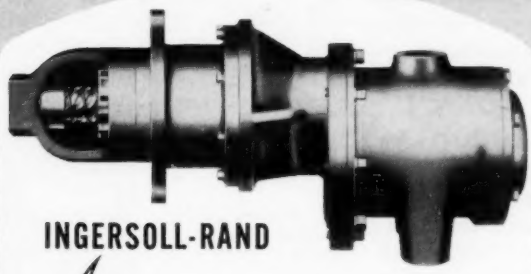


- INJECTOR & FUEL PUMP PARTS for CATERPILLAR — BOSCH G. M. & INTERNATIONAL

INJECTOR EXCHANGE with NO-RE-WORKED PARTS USED

WRITE FOR BULLETIN → G & K DIESEL SERVICE
12 ATLANTIC AVE.
BOSTON, MASS.

NO BATTERIES TO WORRY ABOUT!



INGERSOLL-RAND

Air STARTING MOTORS

give you trouble-free engine starts

RELIABLE—I-R Air Starting Motors are built for fast, sure engine starting—anywhere.

LOW COST—No batteries, generators or electrical parts to buy. Practically no maintenance expense.

COMPACT—I-R Air Starting Motors are lightweight, small but powerful. For all popular gasoline and diesel engine sizes. Easily installed.

Ask your engine distributor to show you the I-R Air Starting Motor line. Or write for Bulletin 5094A.

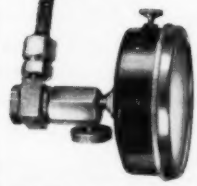
867-18A

INGERSOLL-RAND

11 Broadway, New York 4, N.Y.

KIENE®

MODEL K-120 UNIVERSAL PEAK PRESSURE INDICATOR



For Testing Firing and Compression Pressures on all Models of Diesel and Gas Engines. Dependable — Rugged. May be Used With or Without Flexible Tube.

MODEL K-120 Indicator has but one moving-part — nothing to wear or get out of adjustment.

VALVE — Gas trap type with diaphragm type check valve having adjustable lift. Stainless steel valve and seat.

No springs — No pistons — no complicated adjustments — No temperature corrections — no pressure loss in check valve.

GAGE READS TRUE PRESSURE — MAY BE RECALIBRATED ON ANY GAGE TESTER

Check readings can be made over and over again by releasing indicated pressures with bleeder valve.

ADAPTORS available for most models of engines manufactured in U. S. A. Other models made to order at reasonable prices.

KIENE DIESEL ACCESSORIES, INC.

10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

New Alco Sales Set-Up

The establishment of an entirely new marketing organization for all products of the American Locomotive Co. has been announced. It will be responsible for market research and product planning as well as all field sales. Management changes are as follows:

William A. Callison, formerly vice president of eastern sales, is now vice president in charge of customer relations for all product divisions. William F. Lewis, formerly vice president of western sales, becomes vice president in charge of marketing. Arthur T. Lawrance, formerly southwest regional sales manager for the Products Div., has been named general manager of field sales.

Mr. Callison has been associated with the company since 1929 when he completed an apprenticeship course. Two years later, he became a sales representative at Chicago and was named district sales manager in 1941. In 1947 he became a vice president.

W. A. Callison

W. F. Lewis

A. T. Lawrance

Mr. Lewis joined the company in 1934 in the Chicago sales office, was transferred to the St. Louis sales office in 1937 and named district sales manager there in 1946. He was appointed a vice president in 1950.

Mr. Lawrance has been with the company since 1931 in a sales engineering capacity. Before his new appointment he had been both regional sales manager for the Products Div. and manager of the company's Beaumont Iron Works.

Under the new marketing arrangement, sales offices of various product divisions will be unified. Up to this time separate field sales organizations had been maintained for the various products of the company. Product specialists will now be located at all sales offices so that complete technical information will be available to customers.

Twin Disc Director

N. F. Adamson, vice president in charge of sales of the Twin Disc Clutch Co., was recently elected to the board of directors. He replaces Grover C. Weyland, deceased.

Mr. Adamson joined the company in 1925 as a member of the engineering department, later serving as a sales engineer. In 1935 he was appointed chief engineer and became sales manager in 1944. He was elected vice president in charge of sales and engineering in 1945.

organizational news

Flexonics Promotes

Kenneth H. Flory has been appointed to the position of purchasing agent of the Flexonics Corp. He succeeds R. E. Anderson, who resigned.

Mr. Flory joined the company in 1948 as a buyer and was assistant purchasing agent before his present appointment. Prior to joining the company he had been with General Motors and General Engines.

Electric Machinery Advances

C. E. Buchan has been appointed to the newly created position of general sales manager of Electric Machinery Mfg. Co. He has been with the company 30 years and has been Cleveland district manager for the past 25.

J. J. Wall succeeds Mr. Buchan as Cleveland district manager. For the last four years, he has been a sales engineer in the company's New York district office and has had 10 years of experience in the field.

Are you one of the combustion-wise, dollar-wise Diesel buyers who asks...

"Does it have the LANOVA combustion system?"

The smart diesel buyers of today realize it pays big dividends to ask this all important question, and rightly so! It's a proven fact that high speed diesels using the Lanova combustion system offer many money-saving advantages not available in ordinary diesels.

For example, in diesels that use the Lanova combustion system, the unique and scientifically designed Lanova energy cell creates a violent rotary turbulence in the cylinder. This assures the thorough mixture of fuel and air needed to assure complete, efficient combustion. The cell also isolates and cushions the initial jarring impact of high combustion pressures and feeds them back to the cylinder in the form of smooth working pressures. This timing and control function provides maximum useful power during the working stroke of the piston.

The result is smoother diesel performance, with lower maintenance and operating costs.

Write for the LANOVA story

This 58-page handbook contains complete information about the efficient, money-saving Lanova Combustion System. Send for your free copy today.

Lanova

LANOVA CORPORATION

Dept. 2, 38-15 30th Street, Long Island City 1, N. Y.

One of America's foremost names in diesel research and development

Exide Appoints Sales Manager

Edmund J. Fitzmaurice, Jr. has been appointed sales engineering manager and advertising manager of the industrial division of The Electric Storage Battery Co. He will be responsible for the sales of industrial storage batteries.

Edmund J. Fitzmaurice, Jr.

Mr. Fitzmaurice first joined the company in 1941 as a railway battery salesman. He took leave of absence to work with the Navy and in 1945 returned as a salesman in the Washington, D. C. office. In 1950 he became supervisor of railway and motive power sales, which position he held until his recent promotion.

Cat Elects Vice President

Henry H. Howard has been elected a vice president of Caterpillar Tractor Co., his principal responsibility to be the administration of the company's recently created Engine Div.

Mr. Howard joined Caterpillar in 1926 and was export representative in Austalasia from 1928 to 1931. He then worked four years in the merchandize department and as assistant to the vice president in charge of sales. In 1935, he became manager of the governmental sales division and was named manager of the engine sales department in 1937. From 1943 to 1949 he was general sales manager, and director of sales from 1949 to 1953 when he was named manager of the new Engine Div.

American Bosch Expands

Work has been started on the construction of a new branch plant for American Bosch Corp. in Columbus, Miss. The new factory of approximately 100,000 sq ft is expected to be completed by April. Initially it will be used to manufacture automotive products such as voltage regulators and small motors. W. C. Robinson, vice president, is in charge of the Columbus operation.

organizational news

National Supply Engineer

Walter C. Severin has been appointed sales engineer with the engine division of The National Supply Co. He is at the Portland, Ore. office. Earlier, he was associated with the Venn Severin Machine Co.

Van Norman Changes

Selby F. Greer has been named vice president and manager of the Automotive Div. of the Van Norman Co. to replace George Dickinson who has been transferred to Chicago as division manager.

Mr. Greer has been associated with the company for a number of years, lately having been division manager at Los Angeles. Before joining the organization, he spent 15 years with Borg-Warner as a division manager and from there went to the American Brake Shoe Co. as a division sales manager.

In another announcement, the company makes known the appointment of B. O. Black as manager of the Jacksonville, Fla. district of the Automotive Div. He has had wide experience in the automotive aftermarket field and has spent 17 years in the jobbing business.

Tuthill Pump Chief Engineer

Tuthill Pump Co. announces the appointment of Robert Von Rotz as its chief engineer.

Robert Von Rotz

Mr. Von Rotz has an extensive engineering background covering 27 years of technical and management experience. He has previously been associated with the Ingersoll Milling Machine Co., Vickers, Inc., and the New York Air Brake Co. Prior to his present appointment, he served as chief engineer with the Applied Research and Development Corp.

EMD Elevates Three

The Electro-Motive Div. of General Motors Corp. announces three organizational changes. Robert A. Stoddart has been promoted from assistant comptroller to the newly created position of director of branch operations. Harold P. Gustavson has been advanced to district sales manager, New York, from his post as sales representative. Robert B. Johnstone, former assistant regional service manager, New York, becomes sales representative.

Sealed Power Engineer Dies

Sealed Power Corp. announces that its former chief technical engineer, J. H. Ballard, has passed away. He was 67 years old.

Mr. Ballard first became associated with the corporation in 1929 and served in various capacities until his retirement in 1951. He was well known in the industry as one of the leading piston ring engineers. He held many patents and contributed greatly to piston ring advancement and design.

"Firm Basis" for leadership!

These leading firms, and many more, have chosen Donaldson Air Cleaners to protect their engines against dust.

For the tractors, trucks and other equipment which these engines power, Donaldson Air Cleaners assure high-level performance longer!

This long-life protection and "follow-through" service have made the Donaldson Company the world leader in heavy-duty air cleaners.

DONALDSON COMPANY, INC.
666 Pelham Blvd., St. Paul 14, Minnesota
GRINNELL DIVISION: Grinnell, Iowa
DONALDSON COMPANY (Canada) LTD., Chatham, Ontario

Donaldson AIR CLEANERS MUFFLERS

HILCO

LUBE and FUEL OIL PURIFICATION • • •

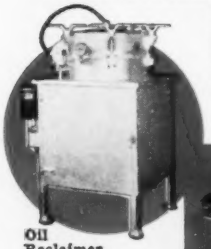
GET RID OF DIRTY OIL . . .
GET LOWER OPERATING COSTS
LONGER EQUIPMENT LIFE

HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all times reduces down time, increases production and HILCO units pay for themselves in savings.

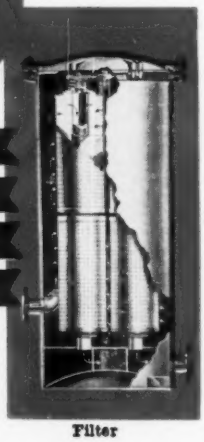
HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

• *THERE'S A* **HILCO** *FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM*



Oil Reclaimer

HILCO has 25 years experience in oil purification. Let this experience work for you.



Filter

PURIFIERS
FILTERS
RECLAIMERS
CONDITIONERS

A complete range of sizes and systems for oil purification.

★ *WRITE FOR* **FREE** *LITERATURE NO OBLIGATION ON YOUR PART*

THE HILLIARD CORPORATION
120 W. FOURTH ST.
ELMIRA, N. Y.

IN CANADA — UPTON-BRADEEN-JAMES, Ltd.
990 Bay St., Toronto, 3464 Park Ave., Montreal

news of our industry

EMD to Market 567 Engine

Cleveland Diesel Engine Div. of General Motors announces that sales and service of the Model 567 engine for industrial application has been transferred to the Electro-Motive Div. However, Cleveland will continue to market and service the model for marine applications.

German Diesels in Brazil

German diesel engine manufacturers are indicating great interest in penetrating the large Brazilian market, either by subsidiary arrangements or by licensing and assembling agreements. From a British source, we learn that the latest addition to such German concerns is the Guldner Motor Works which is initially planning to make engines up to 50 bhp in Brazil.

A Brazilian company, Industria Reunidas de Ferro e Aco Ltda., intends to start production of large diesel engines in cooperation with a group of German concerns which includes Maschinenfabrik Augsburg-Nuernberg and Lokomotivfabrik Esslingen. The Brazilian outfit has been granted a credit of 5 million cruzeiros by the National Institute for Economic Development.

Bulldozers Speed Ship-Loading

The bulk terminal of California's inland seaport, the Port of Stockton, has speeded up loading and trimming of ships by using two small bulldozers to level and spread bulk cargo, predominantly ore, in the holds of ships being loaded. Caterpillar D2 tractors with hydraulically controlled bulldozer blades level off the cargo as it peaks up under the spout of the loader.

The dozers are hoisted from the dock by the ship's winches and lowered into the hold. The tractors are equipped with special armoring, hoisting rings, and spark arresters on the exhaust stacks to adapt them to this use. This is said to be one of the few installations in the world where Cat track-type tractors are used aboard ship.

NOW SHOWING

"WHAT YOU SHOULD KNOW ABOUT DIESEL ENGINES"

NEW P&H COLOR SOUND FILM

It's an all-new sound-slide film . . . that provides clear, concise answers to "What you should know about Diesel engines." Give it a showing, and it will give you a better A to Z understanding of the diesel engine — how it operates; how it compares with gasoline engines; two versus four cycle diesels; why P&H Diesels perform better on tough jobs; how they save money on both operating and maintenance costs.

Plan a review of this educational and entertaining color sound-slide film. Ask your P&H dealer about it . . . or write us for details.

P&H

DIESEL ENGINE DIVISION
HARNISCHFEGER CORPORATION CRYSTAL LAKE, ILLINOIS

the P&H *line*

new products

Hand Tachometer

Confusion and reading errors are said to be minimized by a thumb-operated range selector which automatically changes scale numbers for each range on the new hand tachometer being put on the market by Metron Instrument Co., 432 Lincoln St., Denver 3, Col. The same mechanism also shows the correct number of rpm per scale division to eliminate need for figuring out scale markings for each range.

Tractor-Driven Generator

A new generator designed for belt-drive and producing highline-type electricity (115/230 v, 60-cycle AC) is being offered by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. With this generator, tractor owners may now provide their own emergency electric power.

The generator is available in 3000-, 4000-, 7000-, and 10,000-watt capacity, is mounted on a pivot-type base, and equipped with flat belt pulley. Standard equipment includes an outdoor 2-pole, double-throw, 60-amp manual transfer switch. A protective circuit-breaker mounted in a box guards against excessive overloads. A plug-in AC voltmeter, together with a single receptacle permits the tractor engine speed to be adjusted for desired voltage.

Packaged Parts Loosener

Kano Laboratories, 1000 S. Thompson Lane, Nashville 11, Tenn., announces that it is putting its product, Kroil, into pressurized cans. Kroil is a chemical solvent that is said to penetrate into spaces as small as one millionth of an inch, soften rust, dissolve dried grease and oil, and supply lubrication so that frozen parts can be easily loosened.

The new aerosol pressurized can will shoot a stream up to 3 ft, allowing the operator to have one hand free to loosen the stuck part. It holds 12 oz and is available directly from the manufacturer.

Consult ELLWOOD on all Your Forging Requirements

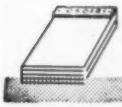
Quality Precision Crankshafts For Diesels — Since 1910 . . .

ELLWOOD CITY FORGE COMPANY

CRANKSHAFTS - CONNECTING RODS

MACHINE FORGINGS

ELLWOOD CITY, PENNA.



order it . . .

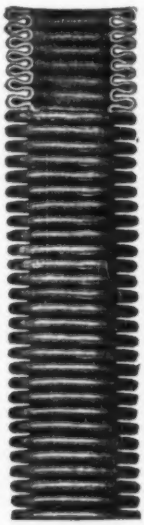
install it . . .

forget it . . .

You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

Bronze, Steel, Stainless Steel, Monel — 1/8"—36" I.D. with fittings as needed.



Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

ATLANTIC

METAL HOSE CO., INC.

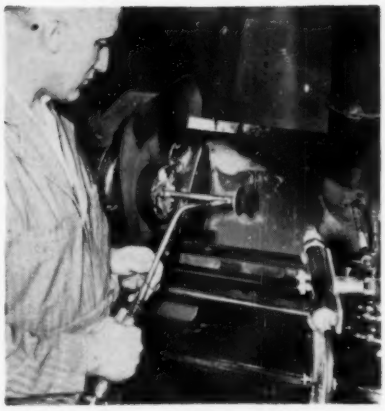
309 Dyckman St.,

New York 34, N. Y.

news of our industry

Spraywelding Reclaims Valves

Diesel engine valves, reclaimed by applying the Colmonoy Sprayweld process to coat worn seating surfaces with an impact and wear-resistant nickel base alloy, are said to be giving excellent performance. In actual running tests in 800-hp diesel freight engines on a southern line, the coated valves indicated practically no wear after 355 days of operation (about 4000 continuous hours), and were still serviceable.



Colmonoy No. 5 alloy, made by Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich., is applied to the worn valves by a 3-step process. The worn seating area is first threaded or grit-blasted to provide necessary mechanical bond for subsequent metal spraying. Then the valve is chucked in an engine lathe or turning fixture and rotated while the powdered No. 5 alloy is applied by a pistol supported in a tool post holder.

This pistol connects through hoses to a wall or pedestal-mounted panel unit that supports a powder hopper, carburetor, air regulator, air filter, and connections to oxy-acetylene tank and air supply lines. The surface is sprayed to a thickness that will provide a finish-ground No. 5 alloy of 0.060 in. In the final step, the valve is rotated under an oxy-acetylene torch to fuse coating to base metal, providing a fusion-bonded, non-porous coating. Seating area is finish-ground on a conventional grinding machine before installation in an engine.

No. 5 alloy is a nickel base containing chromium and boron, nonmagnetic and with a Rockwell C hardness from 45 to 50, melting at 1950°F. It is said to have excellent corrosion-resistance as well as excellent red hardness and its abrasion and galling-resistance qualities are also said to be good. It can be had in cast shapes as well as in powder and bare and coated welding rod form. Its machinability properties enable the surfaces to be easily ground or machined with a carbide tool. This alloy is thus well adapted to valve-reclaiming application.

C-B Expands Diesel Office

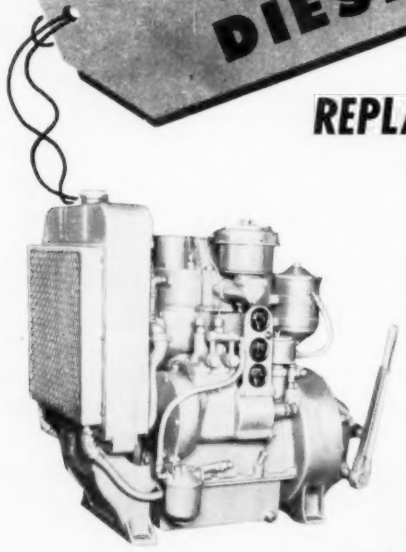
Expanded field service facilities have been housed in a new structure constructed by Cooper-Bessemer at Odessa, Texas. A 2-ton traveling crane has been installed for expediting delivery of heavy engine and compressor parts to the Texas area. The new building is part of the company's program to form a closer working relationship between the factory and users of diesel and gas engines and compressors.

Just the ticket
for your power needs
in the **20 h. p.** class

Sheppard MODEL 17 DIESEL

Low Weight
Compact Size
Low Cost

THE IDEAL REPLACEMENT POWER



THE SHEPPARD Model 17, fills a long standing need for Diesel power in many places. Until now, 2 big factors barred Diesel from many machines using auxiliary power. Its compact size and low weight now make it possible to replace any gasoline engine of comparable rating with this 20 H. P. Diesel. The big need for a compact, low weight diesel of this size has resulted in mass production of the Model 17. This accounts for its surprisingly low price. The Model 17 Sheppard Diesel has opened the way to 75% fuel cost savings for hundreds of power users. It's just the ticket for you, too.

FREE LITERATURE gives complete specifications and information on the highly versatile Model 17 Sheppard Diesel. Write today.

Sheppard Diesels
HANOVER, PA.

POWER • 4 to 100 Horsepower
ELECTRICITY • 2 to 40 K.W.
INDUSTRIAL Wheel Tractors
FARM Tractors and Implements

new literature

Copper-Plated Gears

Brad Foote Gear Works, Inc., Cicero 50, Ill., announces that material shipped on all orders as of the first of this year will be copper-plated. A catalog illustrating some of the various products has just been released.

This is not a new process for the company, it has been producing copper-plated gears for the government, but is claimed to be new in the general gear field. According to the company, copper-plating prevents corrosion before the gears are put in service and eliminates the need for greasing. Due to the lapping action of the thin copper film, a quick and smooth run-in of the gears is said to be accomplished.

GM "71" Cylinder Servicing

A new strip film with sound, "Servicing the Series '71' Cylinder" has been produced by the service department of the Detroit Diesel Engine Div. of General Motors, 13400 W. Outer Dr., Detroit 28, Mich. The information featured has appeared previously in the division's service manuals, but has now been brought together as a graphic training aid for mechanics in the service outlets and for contractors and fleet operators who maintain their own repair facilities.

The film, obtainable from distributors and dealers, covers inspection procedures to be followed in determining the reusability of cylinder parts during engine overhaul. The step-by-step processing needed to restore such parts to factory-set standards is illustrated.

Packaged Dryers

J. F. Pritchard & Co., 210 W. 10 St., Kansas City 5, Mo., has published a bulletin on its Hydryers, packaged dehydration units for reduction of moisture contents of compressed air or other gases to low dew points or concentrations.

In the process, each unit has a charge of solid adsorbent to dry the gas through a specified drying cycle. When the adsorbent approaches its capacity, reactivation follows to remove the adsorbed water and return the adsorbent to its original capacity. Continuous drying calls for two units, one for drying while the other is activated. For intermittent, a single unit is used. Standard units operate on 8-hr and 4-hr cycles, but may be adapted to other cycles.

Forgings and Castings

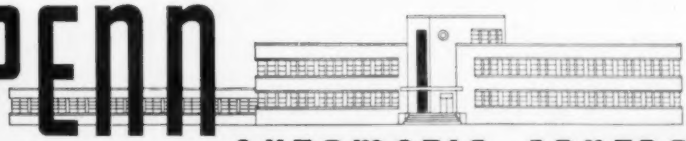
Hammered forgings, composite die sections, and cast-to-shape tool steels produced by the forging and casting division of Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa., are described in a new booklet issued by the firm. Forged shapes available, stainless and tool steel, and weight limits as well as analyses are outlined.

Information includes how to use and order die sections to effect economies. Diagrams of standard shapes are given, along with a guide to uses and types of cast-to-shape steels. Chemical analyses and heat treating instructions for the most common grades are also detailed.

here's why your engine needs this PENN SAFETY CONTROL

Overheated cooling water or lube oil pressure failure can develop anytime in any engine. When it does... the Penn Safety Control goes into action. Automatically it sounds an alarm, flashes a warning light or stops engine operation... whichever you prefer. Then, the fault can be investigated and corrected *before serious damage* occurs! Learn more about this low-cost protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ont.

PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

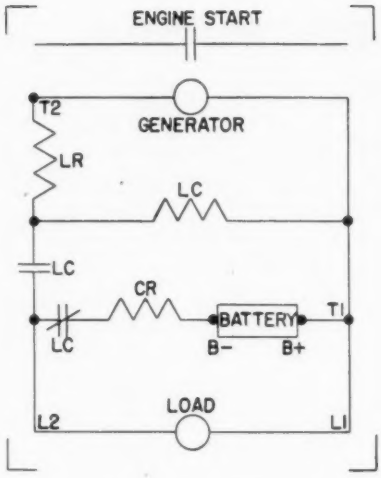
new products

Engine-Generator Control

Automatic Switch Co., Orange, N. J., has placed a new engine-generator control on the market for use with diesel- or gasoline-driven sets. Two features of the control are of major interest.

When any load is turned on, the power unit automatically starts (no master switch to throw). When all loads have been turned off, the plant automatically stops. The other feature is the prevention of stalling. The load is automatically held off until proper voltage and frequency are delivered, and only then is the load connected.

Control operates in this manner: When the load is connected, relay coil CR is energized through normally closed contactor LC. The LR contact on the engine-starting control closes the remote control circuit which starts the plant. Line contactor LC (normally open contact) will not close until the generator is up to speed and frequency. When this



occurs, the load is connected to generator. At the same time, CR is disconnected from the battery.

Controls for 3-wire plants can be used with grounded neutral standby systems. Present ratings range from 60 to 100 watts for 2- or 3-wire generators. Advantages claimed for the unit are: no delicate parts or critical relay adjustments; pilot contacts for starting contactor: magnetic grounding; battery charging; no residual magnetism sticking on relays.

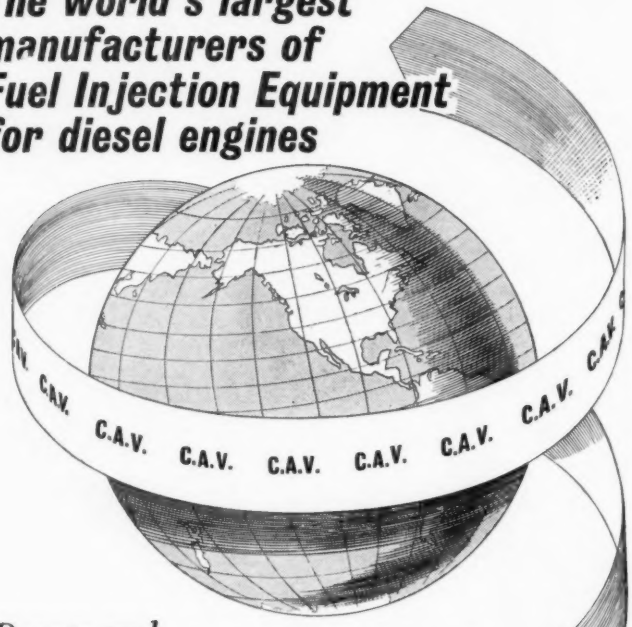
Coil Spring Testing

An inexpensive and simple way of testing compression coil springs has been developed by Farris Engineering Corp., Palisades Park, N. J., utilizing a W. C. Dillon & Co., Inc., (Van Nuys, Cal.), pressure gauge. This arrangement is said to be simple to construct from available shop materials.

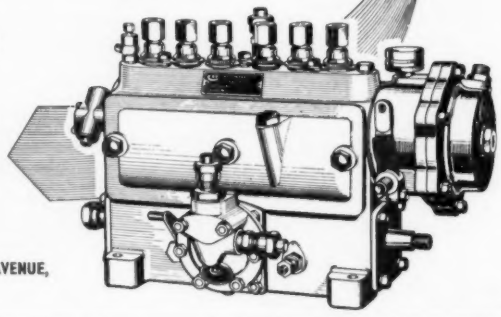
A Dillon mechanical pressure gauge is placed on a scissors-type jack to which a hand wheel has been attached. The spring to be tested is placed on a movable platform or spring washer which is part of a telescoping bar. By turning the hand wheel, the jack is raised and force is applied through the gauge to the telescoping bar. The spring is thus compressed upwardly against the underside of a fixed platform. A fixed scale adjacent to the moving bar permits measurement of deflection. By this means, a reading of the load and deflection characteristics of the spring is obtained.

C.A.V.

The world's largest manufacturers of Fuel Injection Equipment for diesel engines



Depots and Service Agents in over 100 countries



C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC.,
653, TENTH AVENUE,
NEW YORK 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.

C.A.V. Fuel Injection and Electrical Equipment

174-606

news of our industry

New Science Language

Scientists and engineers are beginning to become acquainted with a new language called Interlingua, which is a unification of the dialects of the world. It had its origin in 1923 when an international group organized to simplify the exchange of developments in science by overcoming the language barrier.

The result, Interlingua, is a union of five tongues: English, French, Spanish, and Portugese, with a little German included. Research culminated in a grammar and a 27,000-word Interlingua-English dictionary. Currently being printed is a book using pictures to teach vocabulary, entitled "Interlingua a Prima Vista" (Interlingua at First Glance).

First publications in the language were begun in 1952. One of them, "Spectroscopia Molecular", is published monthly by Dr. F. F. Cleveland, professor of physics at Illinois Institute of Technology. "Most scientists", Dr. Cleveland says, "may be surprised to find that they can read Interlingua with little reference to the dictionary or grammar."

An example: "Energia es necessari pro toto que occurre in le mundo. In tempores passate le plus grande parte del energia applicate esseva fornite per le fortia muscular del homines e del animales domestic". English equivalent: "Energy is necessary for all that occurs in the world. In past times the greatest part of the applied energy was furnished by the muscular strength of men and domestic animals."

Czechs Build Auto Diesel

A report from Czechoslovakia indicates that that country has built a prototype diesel version of the 4-cyl Tatraplan automobile engine.

The standard gasoline unit has a swept volume of 1950 cc with 85-mm bore and 86-mm stroke. It is rated at 52 bhp at 4000 rpm, rear-mounted and forced-air cooled. The conversion to diesel was made at the Tatra works and according to the report, fuel consumption is 34 mpg and top speed 72 mph.

Riss Buys 500 Diesel Trucks

Riss and Co., Inc., said to be one of the largest private trucking operators in the world, has purchased 500 diesel highway tractors from the GMC Truck and Coach Div., one of the largest purchases of such highway equipment on record.

The units are cab-over-engine, tandem-axle models, powered by 6-cyl engines generating 200 hp and capable of hauling 70,000 lb. gross combination weight. GMC model designation is DFT922-67.

Hungarian Diesel Locomotive

A new type of diesel locomotive for stations with heavy volumes of shunting traffic is being made in Hungary. According to reports, this is the result of cooperation between three large engineering works, The MAVAG Engine Works, Gottwald Electric Works, and the Ganz Works. Reports indicate that only one man is needed to operate the locomotive which has a 4-axle drive. The driver is in communication by radio with the chief of the classification yards.

Mounted on International Truck
Mounted on Cummins stationary engine
STANDARD OF THE INDUSTRY
Luber-finer
STANDARD AND OPTIONAL EQUIPMENT ON
AMERICA'S LEADING DIESEL TRUCKS
TRACTORS AND STATIONARY ENGINES
SINCE 1936
Luber-finer Model F-120 & F-155 Diesel Fuel Filters
Luber-finer Model 750-2 & 750-3 Industrial
ALLIS-CHALMERS HD20 DIESEL
and Remember!
only GENUINE
LUBER-FINER PACKS
with Exclusive Patented Process
● REDUCE ENGINE WEAR AND MAINTENANCE COSTS
● CLEAN MORE OIL FASTER
● KEEP OIL CLEAN LONGER
FAR BEYOND THAT OF ANY ELEMENT AT ANY PRICE
Luber-finer Packs Available:
REFINING PACK. For use on straight Mineral Oil, Synthetic Oils, Diesel Fuel Oil, Hydraulic Fluids, etc.
DIESELPAK. Expressly designed and recommended for use with all detergent type compounded oils.
WRITE TODAY for complete information—see how you, too, can save many dollars and hours in maintenance.
GET THE FACTS FREE!
LUBER-FINER, INC., 2508 S. Grand Ave., Los Angeles 7

HONAN-CRANE OIL PURIFIERS

designed for diesels!

ENGINEERED SPECIFICALLY
to provide
LONGER LIFE, GREATER EFFICIENCY, LOWER OPERATING COSTS
for all types of diesel engines

● Three basic models, combining Honan-Crane's advanced engineering features with proven principles of design, meet all diesel engine filtering requirements . . . offer positive protection against costly breakdowns and excessive wear due to contaminated oil. H-C Purifiers are available for any size or make of engine. *Write today for complete information.*

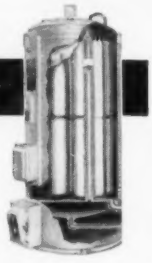
type "B"

MULTI-CARTRIDGE OIL PURIFIER

Uses full size bulk refills of "Cranite" (fullers earth) or "Palconia" (cellulose fiber) filtering medium to remove solids, acids and products of oxidation.

type "M"

BULK REFILL OIL PURIFIER



Uses one to 24 handy, interchangeable refill cartridges containing Cranite, Palconia or cotton waste and excelsior to provide needed range in capacity.

type "F"

FREE-FLOW OIL PURIFIER

Uses interchangeable refill cartridges of Cranite, Palconia or cotton waste and excelsior. Compact design simplifies installation where space is limited.

HONAN-CRANE CORPORATION
305 Wabash Avenue • Lebanon, Indiana
subsidiary of **HOUDAILLE-HERSHEY CORP.**

new literature

Aluminum Brazing Methods

The latest aluminum brazing techniques are being offered by the Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa., in a new 22-min, 16-mm film, "New Horizons in Aluminum Brazing". Basic brazing methods explained are: torch brazing, furnace brazing, and dip brazing.

Illustrated examples of new applications for the process are engine block and head, torque converter part, and an outboard motor assembly. Brazed parts shown are made of aluminum sheet and tube as well as cast, forged, and extruded components. Shown along with what can be done in joining parts by the process are the methods of doing them.

Air Filter Bulletin

Dollinger Corp., 11 Centre Park, Rochester 3, N.Y., has issued a new illustrated bulletin describing its Staynew automatic filters designed for large air volume and efficiency. It contains specifications, engineering and performance data covering a wide range of sizes for handling desired air capacities.

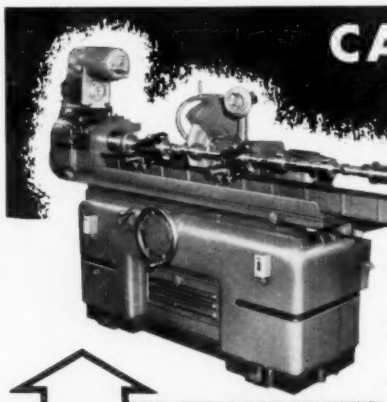
Engineered Valve Parts

Thompson Products, Inc., 8354 Wilcox Ave., Bell, Cal., has issued two bulletins on its products.

One bulletin entitled "Modern Engineered Parts for Gas and Diesel Engines", describes the company's valves, seats, and guides for renewing worn valve assemblies. Methods of manufacture for each product are described and illustrated.

The other bulletin concerns the portable rotary valve seat grinder which is presently being used by many concerns for engine overhaul in the field, and is one of the latest developments of the company. The complete unit weighs 22 lb and is said to be usable with equal ease either in the shop or directly on the engine. The grinding unit is small enough to work in almost all engines which have seats from 3¼-in to 12-in OD.

CAMSHAFT REPAIR SERVICE



★ HARD CHROMIUM PLATING SERVICE
★ CRANKSHAFT GRINDING SERVICE
★ MAGNAFLUX SERVICE

DON'T THROW AWAY EXPENSIVE CAMSHAFTS!

Established 1924 . . . 30 years experience grinding crankshafts!

We make needed repairs to cam lobes and journals on truck, industrial, marine and locomotive engine camshafts. All cams ground with most modern equipment—absolute accuracy in duplication of cam contour. Undersized journals restored to size by hard chromium plating.

Also complete crankshaft grinding service for locomotive, marine, stationary and compressor crankshafts.

NATIONAL WELDING & GRINDING CO.
2929 CANTON ST. DALLAS 1, TEXAS

What Do You Know!

(*Answers to questions on page* 36)

1. Correct answer is "b". Lugging can occur at any speed. If the torque times the rpm will not produce the required horsepower, the engine is lugging. See article on Page 34 for details.

2. "c" is most correct as affecting all three factors. "a" is very pertinent providing that speeds are consistently near top of speed range. See article mentioned above.

3. Correct answer is "b". Angular setting of rotors is adjusted by axial movement of a helical drive gear to prevent lobe contact. See article on Page 42.

4. "b" is correct. Pressure ratio and delivery volume will also affect the horsepower requirements. See the article mentioned above.

5. Correct answer is "c". Filters using these coatings depend on them for efficiency and dirt-holding capacity. Failure to "wick" through dirt leaves a dry surface with little dirt-catching and holding ability. See Page 37 for discussion.

6. Correct answer is "b". Excess coating will "web" over holes, increasing pressure drop, and will tend to run off, causing a mess. There is an optimum amount for each coating that must be determined. For more details see the article referred to above.

7. Correct answer is "b". The article on Page 26 points out how power requirements mushroom out of proportion to increased throughput.

8. Correct answer is "a". For discussion and corrective action to be taken see article on Page 48.

9. Correct answer is "c". Because of the high resistance of insulation a megohmmeter or "megger" will be required. See article mentioned above for more details.

new products

Metal Hardness Tester

The Pacific Transducer Corp., 11921 W. Pico Blvd., Los Angeles 64, Cal. announces a new precision-type metal hardness tester, Model 317, for testing all types of sheet metal both ferrous and non-ferrous.

By use of a calibrated microscope and reticle, reading may be obtained within two points on the Brinell scale. A self-contained battery-type illuminator is included with microscope.

Instrument operates by using a ⅛-in ball with 150-kg load. A precision-ground spring loads ball, and pressure on sheet is applied by a pair of parallel jaw pliers. Indentation so formed is measured with the microscope. Sheet stock from .010 in to .250 in may be measured.

High-Heat Aluminum Paint

Tropical Paint & Oil Co., Cleveland 2, Ohio has developed "Thermalite", a new aluminum paint for use on metal surfaces whose temperatures range from 400°F to 1000°F. Already being used in the diesel industry, the paint is said to provide an excellent finish for manifolds, exhaust stacks, and other areas where high heat is a problem.

According to the company, the paint, formulated with a heavy silicone content, fuses to the surface and will not discolor, blister, flake or burn off and gives protection against severe weather. It is stressed that the paint should not be used where temperatures are lower than 400°F since these metals can be protected by standard paint at lower cost.

Chemical Sealants

Eight new chemical sealants, developed to help provide airtight, leakproof assemblies under various operating conditions, are being introduced for maintenance use by Permatex Co., Inc., 1702 Ave. Y, Brooklyn 35, N. Y. The new compounds are said to have both cold and heat resistant qualities and are described in the company's 1954 catalog now available.

SMALL DIESELS DO BIGGER JOBS — AND STAY ON THE JOB L-O-N-G-E-R

IF YOUR DIESEL IS 75 H.P. OR LESS, there is a small, high efficiency, light weight LOW COST filter that will give you MORE FOR YOUR HORSEPOWER DOLLAR.

MAKES SLUGGISH ENGINES run free—they'll "purr along" longer with more and better working time.

THE Briggs G-800 OIL FILTER

PIONEERS IN MODERN OIL FILTRATION

designed for Diesel engines within this range, has what it takes to make your engine hit its peak of rated horsepower.

1. It helps beat "start-up" wear; frees sticky valves—gives them "zip" and "go". Stops gums, tars, and abrasives in their tracks!
2. Stops corrosion BEFORE IT STARTS and whips crankcase sludge.

TWO Briggs TYPES OIL FILTERS *for*

PIONEERS IN MODERN OIL FILTRATION

• MINERAL OIL

The famous Briggs patented fullers earth block—ABsorbs carbon, dirt and metal particles. ADsorbs engine corroding acids, sludge-forming gums and resins.

DETERGENT OIL •

Briggs convolute wrapped, long fibered, controlled porosity cellulose cartridges—specially processed for the efficent ABsorption of harmful abrasives and solids.

BRIGGS • BETTER RESEARCH
• BETTER MANUFACTURING
• BETTER PERFORMANCE
COSTS NO MORE - - - -

THE BRIGGS FILTRATION CO., Dept. 22
RIVER ROAD, WASHINGTON 16, D. C.

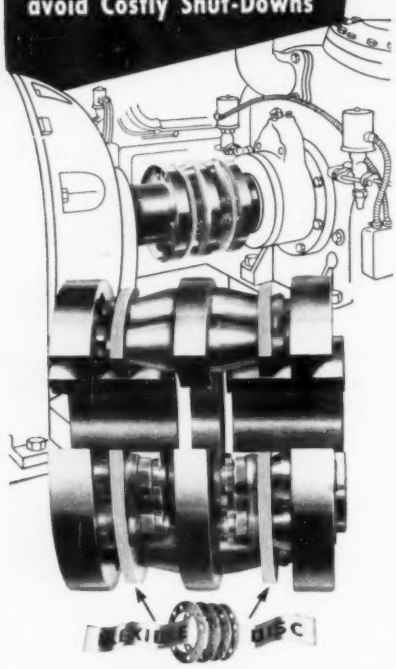
Please send me information showing how other diesel users have reduced costs as much as fifty percent.

Name ..... Title .....

Company .....

Address .....

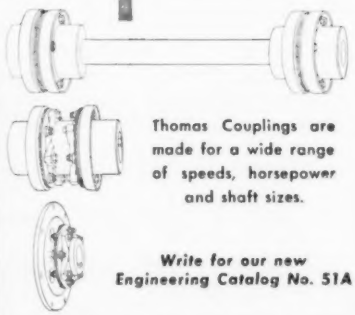
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

news of our industry

GE Locomotive Sales

The General Electric Co.'s locomotive and car equipment department in Erie, Pa. is reported to have produced 1050 electric equipments for locomotives of all types during 1953, to experience its biggest year. This figure includes GE-built locomotives as well as electric equipment for locomotives built by other companies, and represents over a million hp. Of the Erie-built locomotives, one was claimed to be the first underground diesel-electric. The company also supplied equipment for 83 army locomotives built by Alco.

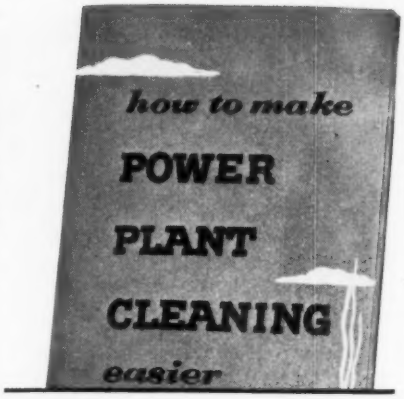
Mr. G. W. Wilson, manager of the department, noted that during the year twice as many locomotives were manufactured for foreign railroads as during the average year since the end of World War II. "We expect the manufacture . . . for foreign roads to continue at a high level, since most foreign roads are not as completely dieselized as U.S. roads," he said.

Looking ahead to 1954, Mr. Wilson foresaw the parts business becoming an increasingly important part of the industry. "Diesel-electric locomotives have been extensively used long enough now to warrant wholesale parts replacement and, in some cases, complete modification," he explained. Better components for moving goods and people with less effort is the immediate goal for 1954.

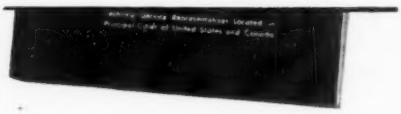
Whistlers Come Back Tooting

Public sentiment, and safety, seems to be forcing the return of one memorable aspect of the old iron horse, the steam whistle. A spokesman for the New York Central System announces that the railroad is installing whistles in place of horns on all its new diesel engines.

Many letters are said to have been received expressing regret at the fadeout of the whistle in favor of the bull horn. To assure safety, a souped-up version of the steam whistle has been developed. The fog horn blast may be good for fogs, but it could not seem to penetrate as far as the shrill old whistler.



Your Guide To Diesel MAINTENANCE CLEANING



Here—in this new Power Plant Cleaning Guide—you will find one money-saving suggestion after another to help speed up your diesel overhauling and reconditioning work. Here, for example, are described the most modern, most effective procedures for:

- **Soaking hard carbon deposits off aluminum pistons**
- **Removing rust and scale from diesel cooling system**
- **Cleaning filters**
- **Desludging lube oil coolers**
- **Degreasing parts before repair**
- **Steam-detergent cleaning**
- **Stripping paint**

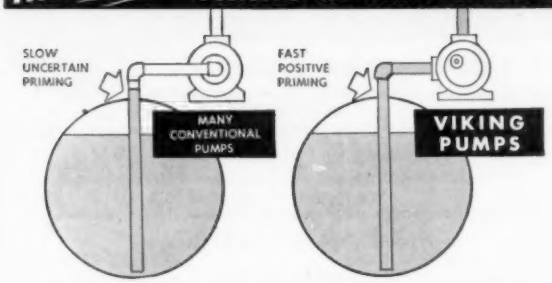
And saving time and money on many other important maintenance operations.

A FREE copy of this informative booklet will be mailed promptly on request. No obligation. Write Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

FAST STARTS WITH VIKING ROTARY PUMPS



It's the fast start and smooth, even flow that gets your pumping job done quicker and at less cost.

No slow, uncertain priming with Viking positive suction pumps. They prime themselves and go to work at once.

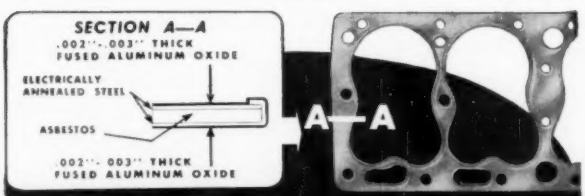
They also save on wear of valves and meters. No sudden jar and spasmodic delivery.

VIKING AN HONORED NAME IN PUMPING

Investigate the smooth, even flow of Vikings today. To start, ask for bulletin 54SD.

See Our Catalog in SWEETS

VIKING PUMP COMPANY CEDAR FALLS, IOWA



FOR A LASTING, PERFECT SEAL IN HIGH COMPRESSION ENGINES *Use Only*

Fitzgerald Metallic Aluminum-Fused-Oxide Steel Asbestos Gaskets

Grease Retainers — Cork Gaskets
FITZ-Rite Treated Fiber Gaskets for oil, gasoline and water connections. Complete Sets For Motor Rebuilders.

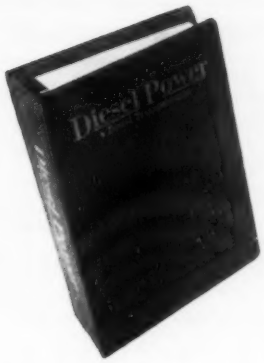
FITZGERALD *Gaskets*

SINCE 1906

The Fitzgerald Manufacturing Company
TORRINGTON, CONNECTICUT

There's a Fitzgerald Gasket for every Engine

Diesel Power Binder



Free

Turns your year's subscription into a lifetime diesel text.

Here is an opportunity to store your back copies in a convenient binder for a handy and permanent diesel reference.

Bound in full-grain leatherette, stained in deep maroon, and embossed in gold, it is a handsome addition to any bookshelf.

You can receive this binder FREE merely by renewing your subscription to Diesel Power NOW; thus:

1. guaranteeing YOU uninterrupted service, after subscription's present expiration date, and
2. saving us future clerical work.

To receive this binder, your bonus for renewing without our billing you, just fill out the form below, attach your renewal fee, and return them to us.

* * * * * *

If you would rather enter a subscription for a friend,—fine. We'll Still send you the binder and notify your friend that you are sending him a gift subscription.

* * * * * *

We have only 2,000 left and over 13,000 subscribers, so reply NOW.

Diesel Power, 192 Lexington Ave., New York 16, N. Y.

Send me a FREE copy of the Diesel Power Binder. Enclosed is the DIESEL POWER subscription fee for the period checked:

U.S. & Possessions ( ) 1 Year $3.00; ( ) 3 Years $6.00
Canada ( ) 1 Year $4.00; ( ) 3 Years $9.00
Elsewhere ( ) 1 Year $5.00; ( ) 3 Years $11.00

EXTEND subscription now going to:

YOUR NAME ..... POSITION .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....
YOUR COMPANY ..... ITS FIELD .....

OR, send gift subscription to:

FRIEND'S NAME ..... POSITION .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....
FRIEND'S COMPANY ..... ITS FIELD .....

NOTE: If entering gift subscription, please print your name and address as well as friend's.

FUEL INJECTION SALES & SERVICE

SAVE TIME AND MONEY BY EMPLOYING FUEL INJECTION SPECIALISTS

CALIFORNIA

D—I—G—S

Diesel Injection & Governor Service, Inc.

authorized AMERICAN BOSCH — SALES & SERVICE
AMERICAN HAMMERED PISTON RINGS
Specializing in all types fuel injection systems & governor repair
985 Seventh St. Oakland, Calif.
Phone: Templebar 6-0733

FLORIDA

MIAMI—IN FLORIDA
FLORIDA DIESEL SERVICE CO.

American Bosch Fuel Injection Service
LEECE NEVILLE—DELCO WICO-FAIRBANKS MORSE
1930 N. Miami Ave. Phone 35015

MARYLAND

CENTRAL DISTRIBUTORS

Maryland — Delaware — District of Columbia
For American Bosch and Scintilla Diesel Fuel Injection Equipment Service and Sales
PARKS & HULL
Automotive Corporation
1033 Cathedral Street — Baltimore, Maryland — SA. 7-8383

MASSACHUSETTS

NEW ENGLAND SERVICE

W. J. CONNELL CO.
Diesel Fuel Injection and Governor Service
Newton Industrial Center BOSTON, 64 DEcatur 2-3630
Airport Road HARTFORD, CONN. Tel. 5-3403

MISSISSIPPI

Womack Brothers **DIESEL SERVICE**

******

Diesel Fuel Injections, Starting Lighting, and Magneto Sales and Service
1321 S. Gallatin St. Jackson, Mississippi

MISSOURI

DIESEL FUEL INJECTION SERVICE CO.
9331 S. Broadway
St. Louis 23, Missouri

DISTRIBUTORS OF FUEL INJECTION EQUIPMENT
We service and stock parts for:

American Bosch
Bendix Scintilla
Adeco Products
Demco
Cooper-Bessemer
Fairbanks Morse O.P.
Excello
Caterpiller Nozzles
Cummins Nozzles
GM. 71 Series
GM. 567—278—268
Woodward Governors
Pierce & Handy Governors
Bacharach Nozzle Testers
Motorite Compression Testers
American Bosch Fuel Filters

Phone: Vernon 2-2121

MISSOURI

ST. LOUIS, MO.

2900 Washington Blvd. Phone: Jefferson 7200
Electric Parts & Service Co.
American Bosch Fuel Injection—Electrical
Carburetor & Magneto Service

NEW YORK

AUTHORIZED SALES & SERVICE
American Bosch — Bendix — Demco
We service all makes of
Fuel injection equipment & Hydraulic Governors
A & D Diesel Service, Inc.
145 — 21st St. Brooklyn 32, N. Y.
South 8-3461-7637

NEW YORK

CORETTI-GROSS, Inc.

Complete Engine & Accessory Unit Reconditioning
Gasoline & Diesel
44 SECOR LANE PELHAM MANOR 65, N. Y.
NYC Phone FAirbanks 4-7700 PElham 8-3900

NORTH CAROLINA

Don't Neglect THE FUEL INJECTION EQUIPMENT ON YOUR DIESEL ENGINE . . . . .

Getting top performance from a Diesel engine depends on the condition of the fuel injection system. Play safe by getting in touch with us. We have factory trained mechanics and the official repair and testing equipment needed for doing the job the right way.

CAROLINA RIM & WHEEL CO.
301 East 8th St. Phone 7-1093
CHARLOTTE, N. C.

NORTH CAROLINA

DIESEL INJECTION SALES & SERVICE
fully equipped to service
American Bosch, Bendix Scintilla, Caterpillar, Cummins and International fuel systems
Pierce, Marquette & Woodward governors
3015 HILLSBORO STREET RALEIGH, N. C.

OKLAHOMA

MAGNETO IGNITION COMPANY, INC.
TULSA, OKLAHOMA
Authorized Service and Sales
AMERICAN BOSCH — SCINTILLA
701 West 5th PH-2-8197

PENNSYLVANIA

SULLIVAN BROS.

Fuel Injection—Governors
American Bosch Distributors
1718 Fairmount Avenue
445 North 63rd Street
PHILADELPHIA PENNSYLVANIA

TENNESSEE

AMERICAN BOSCH SERVICE STATION
Genuine Parts and Complete Rebuilding
Cummins — Waukesha — Buda — Nordberg — Kohler Engines
PRECISION PARTS CORPORATION
400 N. First St. Nashville, Tenn.

FUEL INJECTION SALES & SERVICE

SAVE TIME AND MONEY BY EMPLOYING FUEL INJECTION SPECIALISTS

TEXAS

BEARD and STONE

FUEL INJECTION — ELECTRICAL — CARBURETOR AND MAGNETO SERVICE

Houston - Dallas - Texas

TEXAS

Womack Brothers DIESEL SERVICE

Diesel Injection Pump & Nozzle
Sales & Service

123 W. Carolina, SAN ANTONIO, TEXAS
1302 Caldwell, CORPUS CHRISTI, TEXAS

VIRGINIA

DIESEL INJECTION SALES & SERVICE

Fuel Injection-Governor Specialists

SERVICE SALES: All Makes & Types

814 8th Street, SALEM, VIRGINIA
808 Union Street, NORFOLK, VIRGINIA

WASHINGTON

SEATTLE INJECTOR CO.

Fuel Injection Equipment and Accessories for Internal Combustion Engines

Sales Service

2706 Second Avenue, Seattle 1, Washington
Telephone SEneca 2966

news of our industry

See 1954 Railroad Diesel Rise

An upturn in diesel locomotive business during the first six months of 1954 has been forecast on the basis of present orders at Electro-Motive Div. of General Motors. "Electro-Motive's rate of new locomotive production for the first half of 1954 represents a 25 per cent increase over the rate for the last six months of 1953," N. C. Dezendorf, general manager, revealed.

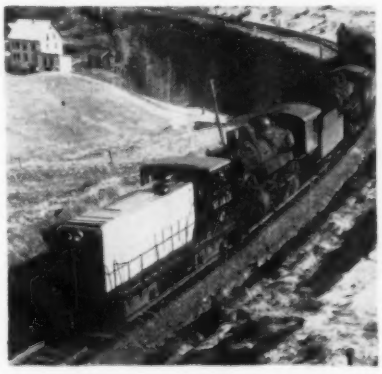
He pointed out that as of Sept. 30, there were still 12,524 steam locomotives owned by U.S. roads. It is stated that the most significant changes in GM diesel motive power since 1946 will take place this year with introduction of a new line of units which are said to haul 15 per cent more tonnage, faster and at lower cost. Hp ratings have been upped from 6000 to 7000 in 4-unit freights and from 2250 to 2400 hp in single passenger units.

Shell Noise Gag Ups Tube Sales

With the adoption of galvanized steel flexible tubing as a means of silencing shell noise between manifold and muffler on motor vehicles, Flexonics Corp. has added 5000 sq ft to its Savanna, Ill. factory for the purpose of making the product. Convolutions in the tubing are reported to absorb noise more effectively than other pipe coverings tried.

Flexonics has long manufactured its RT-6 flexible metal tubing for "100 and 1" automotive applications. Discovery that flexible tubing, as pipe covering, could block objectionable noises from being transmitted to the vehicle interior brought about its new use. To handle increased demand the company consolidated and expanded manufacturing operations. Formerly the tubing was made in two stages at Savanna and Rock Falls, Ill.

Young Leads the Old



Shown here are two retired steam locomotives being hauled from St. Johnsbury, Vt., by a new Cooper-Bessemer-powered 70-ton diesel locomotive. Some of the last to be retired, the steamers are being replaced by modern, efficient diesels said to be saving the St. Johnsbury and Lamoille County Railroad substantial amounts of money in fuel and operating costs to offset rising costs.

Lower Highway Building Costs

Recent declines in highway construction costs average ten per cent and will produce an estimated $320,000,000 savings for the nation's road program, according to the American Petroleum Institute's industries committee. Reporting on a recent survey covering a cross-section of states, the committee states that a highway costing $100,000 per mile and stretching from New York to Los Angeles could be built with funds which will be saved through lower costs.

The cost decline started early in 1953 and has accelerated in recent months, said to be principally due to increased competition among contractors. "The combination of declining construction costs, steadily increasing highway revenues, and the rapidly improving material supply situation makes the outlook for highway construction brighter than at any other time in recent years", the committee states.

Canada Diesels to Mexico Rails

The National Railways of Mexico has started receiving shipment of an order for 15 diesel-electric locomotive units from Montreal Locomotive Works, Ltd. The first 2-unit, 3200-hp road locomotive was recently sent over six Canadian and U.S. railroads, to be put into fast freight and passenger service as part of a railroad modernization program now being carried on in Mexico.

CRANKSHAFT REPAIRS

SPECIALIZING IN LARGE CRANKSHAFTS

CALL OR WIRE

MAIN 2-5242

BRODIE SYSTEM
AN ENGINEERING SERVICE

Shafts brought to standard sizes—
no need for undersize bearings

- REGRINDING
- STRAIGHTENING
- THERMIT WELDING
- METALLIZING

115 CLIFTON PLACE, BROOKLYN 38, NEW YORK
LARGEST CRANKSHAFT GRINDER IN A JOBBING SHOP

new literature

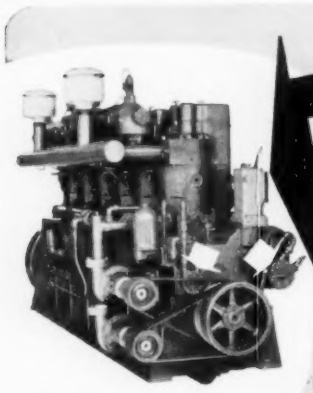
Electric Heat Applications

Principal industrial electric heating applications and methods are described in a 32-page booklet, "101 Ways to Apply Electric Heat", issued by Edwin L. Wiegand Co., 7665 Thomas Blvd., Pittsburgh 8, Pa. Physical aspects of installation are shown along with description of the problem, solution, and advantages obtained.

Emulsion Cleaners

The development of a complete line of seven emulsion cleaners, recently announced by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Cal., is now covered by complete literature available from the company. Included in the literature is an emulsion cleaner reference chart which lists specific uses, dilution ratios, diluents used, methods of application, flash points, and safety factors of each.

According to the manufacturer, the cleaners offer a very simple spray-on method of removing grease and oil from metals and machinery. Added in small amounts to petroleum solvents, the cleaners are said to act like soap with water, increasing penetration, speeding cleaning action, and improving rinsing properties. Used at high dilutions, they are claimed to be inexpensive and to require no expensive equipment or highly trained operating personnel.



For POSITIVE LUBRICATION

It Pays to Specify
TUTHILL PUMPS

For dependable lubrication of diesel engines and power units, Tuthill offers a complete line of positive displacement pumps, designed for lubricating and scavenging. Included are automatic reversing pumps and stripped models for built-in applications.

Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

Special Notice

Readers changing address for MOTORSHIP should use this form:

OLD ADDRESS

Company .....

Box or Street No. .....

P. O. ..... Zone .....

State .....

NEW ADDRESS

Name .....

Company .....

Box or Street No. .....

P. O. ..... Zone .....

State .....

Please print name and address and give P. O. ZONE number.

DIESEL POWER
AND DIESEL TRANSPORTATION

Avoid Crankshaft Failures · Economics · Product Preview · Rubber-Tired Freight Train · Residual Fuel Oil · Sewage Treatment Works · Air Filters · Power Units · Tooling · Flexible Couplings · Lubricating · Railroad Storekeeping · Free Piston Engine · Stand-By Power · Dual Fuel · Engines · Space-Saving Engineers · Temperature Control · Diesel Briefs · Field Notes · Measurement of Ash Content · Diesels · "Angle" Compressor · Practical Pointers · Clean Spray Tips Properly · More Diesels · Metered Maintenance · What Do You Know! · Turner Turnpike · Cleaning · Water

Consolidated Index for 1953

January

EDITORIAL

Public Relations in Municipals 29

ARTICLES

Diesel Engine Prospects for 1953 32
Now About Antifreezes 36
Diesel Power in the Delta Country 39
Waukesha Turbocharges Diesels 40
Cleaning Sharples Centrifuge Bowls 44
Detroit Diesel's 51 Series Engines 46
Maintaining Traction Motor Bearings 74
National Supply's Lister Diesels 79

BUYERS' GUIDE

A convenient and comprehensive listing of engines, accessories, equipment and services for the diesel industry, with the names and addresses of manufacturers 47

February

EDITORIAL

You Can't Halt Progress! 33

ARTICLES

New Engine Carries 71% of Output 36
More Pipeline Power for Greater Throughput 38
Erie's Maintenance Program 41
Diesel's at U. S. Steel's Fairless Works 44
Tools and Equipment for Greater Plant Efficiency 46
Minneapolis-Moline's Model "U" Diesel 49
Nordberg's "FSE" Engines 52
Applying Fuel Injection Equipment to Diesel Engines 54
Diesel Fork Lifts for Safety and Economy 60

March

EDITORIAL

What About Air-Cooled Diesels 33

ARTICLES

Diesel Improves Steam Plant Efficiency 36
Rotary Oil Rigs Invade Pennsylvania 39
Southwestern Greyhound Stresses . . . "PM" 40
Diesel Locomotives in . . . Thailand 44
. . Pakistan 45
Preventive Maintenance Records 46
Matching Batteries and Starting Equipment 52
Care Cuts Maintenance Costs 58
Rail-Mounted Stand-By Power 60
Dirt Causes Failures 62
Buda's "516" Engine 65
GM "71" Cylinder Liner and Piston Fits 66

April

EDITORIAL

Don't Be Smug 53

SPECIAL FEATURE

Engine Specifications for 1953 73
In addition to a complete tabulation of American built diesel engines, a listing is given of imported engines now available in this country.

ARTICLES

Two Years With Bunker "C" Fuel 56
Three Truck Loads in One 61
Mack's Diesel-Electric Rail Bus 62
Woodsfield, Ohio Cuts Costs With Dual Fuel 64
New York Central Investigates . . . Diesel Wheel Slip and Slide 68
Molybdenum Disulfide as a Lubricant 90
Bison Freight Line Repowers 94
Controlling Combustion in Dual-Fuel Engines 96
A Field Problem in Instrumentation 99
Where Are Small Engines Going? 100

May

EDITORIAL

Concerning Instruction Manuals 25

SPECIAL FEATURE

The Spectrograph as a Maintenance Tool 42
A report on the development of the spectrograph as a maintenance tool as applied to railroad operation.

ARTICLES

Tarboro Cuts Costs 28
Diesels Serve Rhodesian Railways 31
Automatically Controlled Stand-by Power 32
Let Power Tools Do the Work 36
The BARC 38
Dart's New 60-Ton Dumper 49
FM's Small OP Engine 50
Screw-In Valve Inserts Can Be Practical 53

June

EDITORIAL

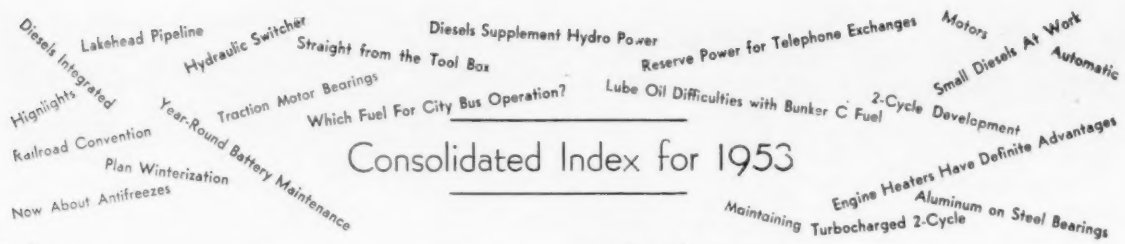
Thoughts at an OGP Conference 35

SPECIAL FEATURE

Gas Turbine-Electric Locomotives—A Progress Report 54

ARTICLES

First Supairthermal Duafuel Installation 38
New Compressor Stations Boost Pipeline Capacity 41
De Laval's High-Pressure Turbocharger 44
Diesels in the Palouse 48
New Type Hangar—Diesel-Powered 51
Nordberg's Supairthermal Vee 60
Diesel-Powered Towmotors 63



Consolidated Index for 1953

July

EDITORIAL

Economics for Embryo Engineers 33

ARTICLES

The Rockaway Sewage Treatment Works 36
Highlighting the Atlantic City Railroad Convention 40
The Turner Turnpike 44
Automatic Stand-By Power Units 48
Diesels Integrated with Hydro and Steam 50
Rayville Boasts First Dual Fuel O.P. 75
Small Thermostat for Lube and Water Temperature Control 78
Avoid Crankshaft Failures 80
EMD's Hydraulic Switcher 83

BUYERS GUIDE

A convenient and comprehensive listing of engines, accessories, equipment and services for the diesel industry, with the names and addreses of manufacturers 53

August

EDITORIAL

Likes and Dislikes (Engines, that is) 37

SPECIAL FEATURE

Cooper-Bessemer's Free Piston Engine 42
This newly developed engine provides a source of hot gases for turning a gas turbine, with extremely high overall thermal efficiency.

ARTICLES

Sioux Center, Iowa 40
Rubber-Tired Freight Train 45
Lube Oil Difficulties with Bunker C Fuel 46
Mack's Thermodyne Diesel 50
Stand-By Power in Mexico 54
Lubricating Flexible Couplings 56
More Diesels for the JCL 62
Clean Spray Tips Properly 65

September

EDITORIAL

Commenting on 2-Cycle Development 29

ARTICLES

Murray City, Utah 32
800-HP Switcher by Alco-GE 34
Clark's Turbocharged 2-Cycle "Angle" Compressor 36
Aluminum on Steel Bearings 38
Practical Pointers for Year-Round Battery Maintenance 42
Measurement of Ash Content in Residual Fuel Oil 44
Dart's "Aardvark" 47
Plan Winterization Now 50
Engine Heaters Have Definite Advantages 55
Reserve Power for Telephone Exchanges 58
How Diesels Affect Railroad Storekeeping 59

October

EDITORIAL

Thoughts on a Bad Brake 37

ARTICLES

GM Series "71" Engine Tune-Up 40
Cleaning—A Part of Maintenance 48
Maintaining Fuel Injection Nozzles 50
Visually Analyzing Bearing Troubles 58
Maintenance Hints from the B & O 64
Nut and Bolt Data Sheet 67
Checking the I-H Injection System 68
Flexible Hoses 73

November

EDITORIAL

What About Tariffs? 29

ARTICLES

Diesels Supplement Hydro Power 32
The Lakehead Pipeline Goes Through 36
Williamsport Technical Institute 39
Teague, Texas Adds an Engine 40
Small Diesels At Work 44
Which Fuel For City Bus Operation? 50
Containing Crankcase Explosions 54
Annual LMOA Convention Proceedings 57
Metered Maintenance At Broken Bow, Nebraska 58
Caterpillar's Oil-Type Clutch 61

December

EDITORIAL

Stretching Fuel Dollars 33

ARTICLES

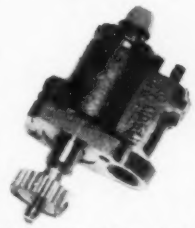
Hamilton Engine—Freeport's Latest 36
Preview of EMD's '54 Line 42
Sheppard Introduces Larger Unit 45
El Paso Expands System 46
Reading Exhibits New Equipment 50
Neodesha Adds "DuaFuel" Unit 54
Diesel Powef on the Santa Fe 57
Get the Most from Your Air Cleaner 58
Hydrotor—A Hydraulic Cranking Motor 62
Cooling System Corrosion Problems 64

Insist on VELLUMOID for Quality

GASKETS AND SHEET PACKING FOR OIL, WATER AND GASOLINE

THE VELLUMOID COMPANY • WORCESTER 8 MASS.

Production Reconditioning of GMC and CAT Diesel Fuel Injection Equipment



Plungers and Bushings
GM 71—$ 5.50
GM 567—$10.55
GM 110—$10.55

Complete Injectors
GM 71—$11.90
GM 110—$18.75

Cat pumps—(Any size) $16.00
Cat nozzles—(Any size) $10.70

Dealer propositions

HANCOCK DIESEL SERVICE
300 Walnut Street Findlay, Ohio

D.P.S. THERMOMETERS

These instruments are a series of marine type thermometers designed for all diesels and all plant uses — water-oil-exhaust.

FEATURES All brass construction, nickel finish, cork insulation.

(Repair service available)

No. 416H $5.25 Ea. Price
No. 426F $4.50 Ea.

35 years continuously in the diesel engine game.

Write for catalog.

DIESEL PLANT SPECIALTIES CO.
Stevens Point, Wisconsin

DIESEL ELECTRIC POWER

For IMMEDIATE SHIPMENT
Unit Capacities
100 to 1875 Kva A.C.
50-60 Cycles
Various Voltages

Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

"SPECIALISTS IN DIESEL POWER"

A. G. Schoonmaker Co., Inc.
56 Church St., New York 7, N. Y.

WANTED TO BUY

Used, Uncracked Cummins, GM, Buda, Caterpillar, International Crankshafts

ANY UNDERSIZE

Write for complete information and our Industrial Price Sheet on hard-surfaced factory standard size crankshafts.

AMERICAN CRANKSHAFT CO.
Charlotte 1, N. C.

USE BELL INJECTOR CUPS and TIPS
STANDARD AND 21° FOR THE LEADING TRUCK DIESELS
Years of proven service
Volume production on automatic machines means SAVINGS
We pass this on to the consumer
Sold by all parts houses

BELL DIESEL RESEARCH
Pioneers in research and manufacture of high speed diesel injection equipment.
626 W. Colorado Blvd. GLENDALE, CALIF.
Telephone: Citrus 1-4721

WANTED

for Murder:::

CANCER is the cruelest enemy of all. No other disease brings so much suffering to Americans of all ages.

YET—though 23 million living Americans will die of cancer, at present rates—there is reason for hope. Thousands are being cured, who once would have been hopeless cases. Thousands more can have their suffering eased, their lives prolonged. And every day, we come closer to the final goal of cancer research: a sure and certain *cure* for all cancer.

THESE THINGS have all been helped by *your* donations to the American Cancer Society. *This* year, please be especially generous!

Cancer
MAN'S CRUELEST ENEMY
Strike back—Give
AMERICAN CANCER SOCIETY

Uniflo
EXHAUST MUFFLERS and SPARK ARRESTORS

The Answer to Annoying Exhaust Noise!
"ENGINEERED TO YOUR INDIVIDUAL NEEDS"
*UNIFLO T.M. Reg. *Send for Bulletin # M-728*

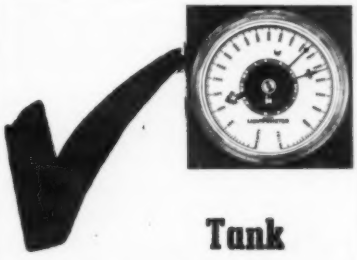
MARINE PRODUCTS & ENGINEERING CO.
150 NASSAU ST. NEW YORK 38, N.Y. REctor 2-7863

MEN TRAINED

IN PROTECTIVE MAINTENANCE AND GENERAL OVERHAUL

Diesel Engines, Tractors and Heavy Equipment

We specialize in the practical phase of training. Shop Method Home study. If you are employed in this field and need better "Know How", or if you are an Employer and need trained Men, Write Today! INTERSTATE TRAINING SERVICE, Dept. A-28-B, 4035 N.E. Sandy Blvd., Portland 13, Ore.



Tank Contents At A Glance

With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No Diesel plant is complete without one. Liquidometer or Levelometer models are available for tanks of any capacity.

Write for complete information

THE LIQUIDOMETER CORP.
36-24 Skillman Ave., Long Island City, N. Y.

ADVERTISERS' INDEX

A & D Diesel Service, Inc. 78
Aeroquip Corporation ***
Air-Maze Corporation, The 14
Allison Division, General Motors Corp. 8-9
American Brass Co. 17
American Crankshaft Co. 83
American Locomotive Co. ***
American Motors Co. ***
Atlantic Metal Hose Co. 69

Bacharach Industrial Instrument Co., Inc. 60
Baldwin-Lima-Hamilton Corp. 18
Beard & Stone 79
Bell Diesel Research 83
Bendix Aviation Corp. Scintilla Div. 6
Blackmer Pump Co. 60
Borg-Warner Corp., Rockford Clutch Div. ***
Briggs Filtration Co., The 75
Brodie System 80
Brush ABOE, Inc., Petter Engine Div. 7
Burgess-Manning Co. ***
Burlington Instrument Co. ***
Burmeister & Wain American Corp. ***

Carolina Rim & Wheel Co. 78
C. A. V., Ltd. 72
Chicago Metal Hose Division ***
Cities Service Oil Co. 5
Connell Co., W. J. 78
Coretti-Gross, Inc. 78
Cooper-Bessemer Corp., The ***
Cummins Engine Co. ***
Cuno Engineering Corp. ***

De Laval Separator Co. 16
Delco Products Div., General Motors Corp. ***
Detroit Controls Corp. 63
Detroit Diesel Engine Division, Gen. Motors Corp. ***
Dexter Folder Co., Miehle-Dexter Supercharger Div. ***
Diesel Fuel Injection Service Co. 78
Diesel Injection & Governor Service, Inc. 78
Diesel Injection Sales & Service 78, 79
Diesel Plant Specialties Co. 83
Dollinger Corp. ***
Donaldson Co., Inc. 67

Electric Parts & Service Co. 78
Electric Storage Battery Co., The ***
Electro Motive Div., Gen. Motors Corp. 13
Elliott Co. Third Cover
Ellwood City Forge Co. 69
Enterprise Engine & Machinery Co. ***
Erie Forge & Steel Corp. ***

Fairbanks-Morse & Co. ***
Fairchild Engine & Airplane Corp. 15
Federal-Mogul Corp. ***
Fitzgerald Mfg. Co. 77
Flexonics Corp. ***
Florida Diesel Service Co. 78
Fram Corp. 63
Fulton Sylphon Div., Robertshaw-Fulton Controls Co. ***

G & K Diesel Service 64
General Motors Corp., Allison Div. 8-9
General Motors Corp., Delco Products Div. ***
General Motors Corp., Detroit Diesel Engine Div. ***
General Motors Corp., Electro-Motive Div. 13
General Motors. Harrison Radiator Div. ***
Good-All Electric Mfg. Co. 59
Griffin Equipment Corp. 61
Gulf Refining Co. 10-11

Hancock Diesel Service 83
Harnischfeger Corp., P & H Diesel Div. 68
Harrison Radiator Div., Gen. Motors Corp. ***
Hilliard Corporation, The 68
Honan-Crane Corp. 74

Illinois Testing Laboratories, Inc. ***
Ingersoll-Rand Corp. 65
Interstate Training Service 83

Johnson Bronze Co. 54

Kiene Diesel Accessories, Inc. 65
Koppers Co., Inc., American Hammered Piston Rings Dept. ***

Lanova Corporation 66
Liquidometer Corp., The 83
Luber-Finer, Inc. 73

Magneto Ignition Co., Inc. 78
Manzel ***
Marine Products & Engineering Co. 83
Maxim Silencer Co., The ***
Miehle-Dexter Supercharger Div., Dexter Folder Co. ***

National Forge & Ordnance Co. 2
National Supply Co. ***
National Welding & Grinding Co. 74
Nickel Cadmium Battery Corp. 55
Nordberg Mfg. Co. ***
Nugent & Co., Wm. W. ***

Oakite Products, Inc. 76

Parks & Hull 78
Penn Controls, Inc. 71
Petter Engine Div., Brush ABOE, Inc. 7
Pierce Governor Co., The 64
Powers Regulator Co. 61
Precision Parts Corp. 78
Pure Oil Co., The 16A, 16B
Purolator Products, Inc. ***

Quincy Compressor Co. 62

Rockford Clutch Div., Borg-Warner Corp. ***

Schoonmaker, A. G., Inc. 83
Scintilla Div., Bendix Aviation Corp. 6
Sealed Power Corp. 24
Seattle Injector Co. 79
Sharples Corp., The ***
Sheppard Co., R. H. 70
Sinclair Refining Co. 22
Snap-On Tools Corp. 58
Standard Oil Co., Inc. (California) 19
Standard Oil Co., Inc. (Indiana) Fourth Cover
Stratoflex, Inc. 59
Sullivan Brothers 78
Synchro-Start Products 21

Texas Company, The 2nd Cover & 1
Thomas Flexible Coupling Co. 76
Tuthill Pump Co. 80

United Specialties Co. ***
U. S. Hoffman Machinery Corp. 57

Van Der Horst Corp. ***
Vellumoid Co. 83
Viking Pump Co. 77

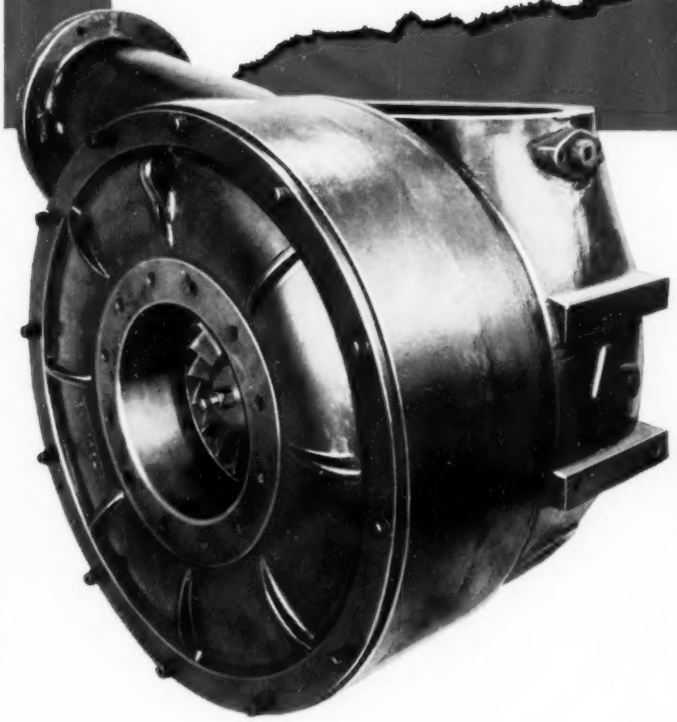
Waukesha Motor Co. ***
Weston Electric Instrument Corp. ***
White-Roth Machine Corp. ***
Worthington Corporation ***
Womack Brothers 78, 79
Winslow Engineering Co. 12
Wyman-Gordon Co. ***

Young Radiator Co. 4

Zollner Machine Works ***

Another forward step in ELLIOTT Turbocharger Progress...

Cooper-Bessemer announces new turbocharged 2-cycle engine



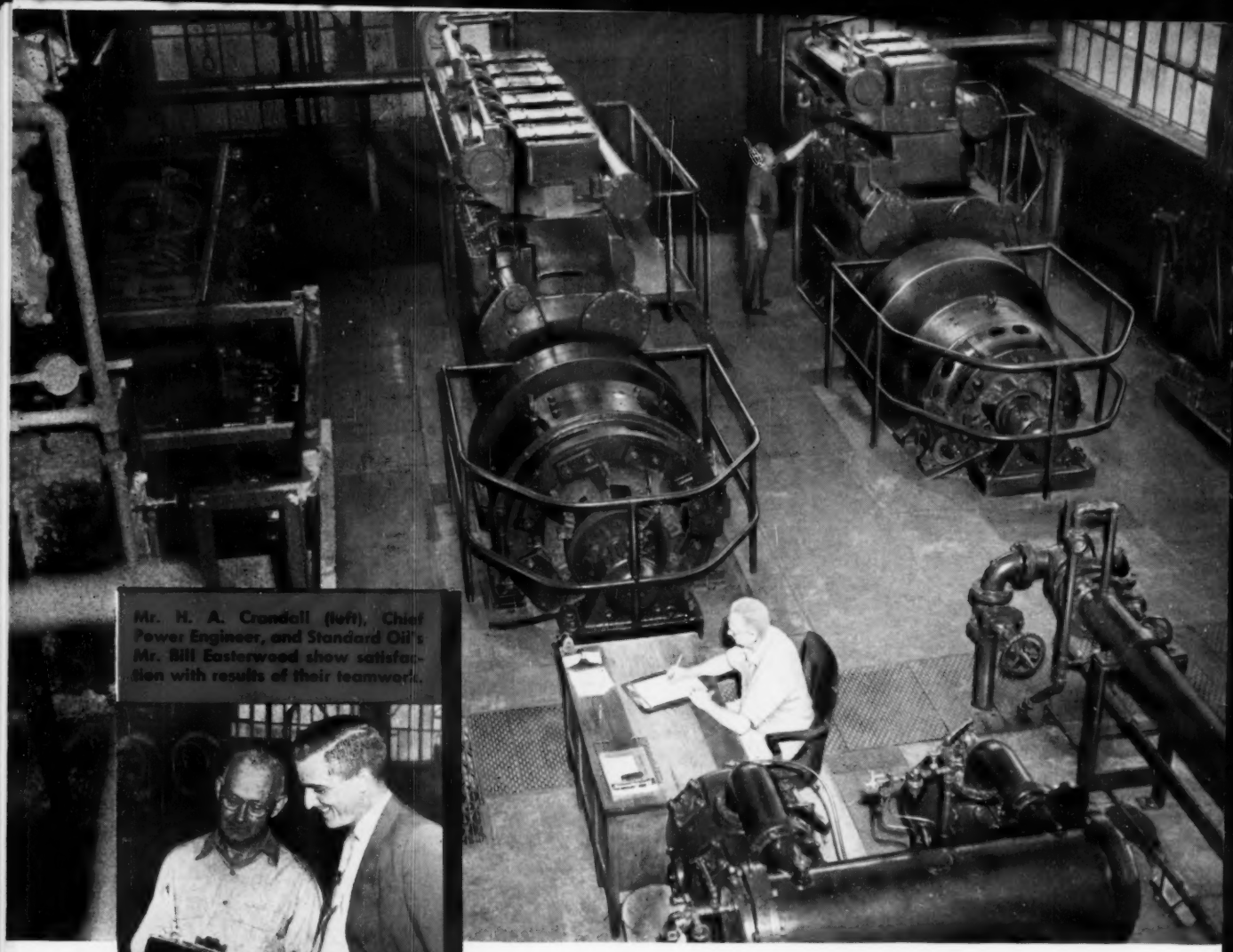
ELLIOTT TURBOCHARGERS have played a vital part in the development of diesel and gas engine power. Now, in this *first* Cooper-Bessemer *turbocharged two-cycle engine* for commercial use, the Elliott name once again is significant. More than 13 years of refinements in engineering design and manufacturing have combined to produce a turbocharger that offers HIGHER PRESSURE RATIOS, IMPROVED EFFICIENCY and MORE AIR FLOW.

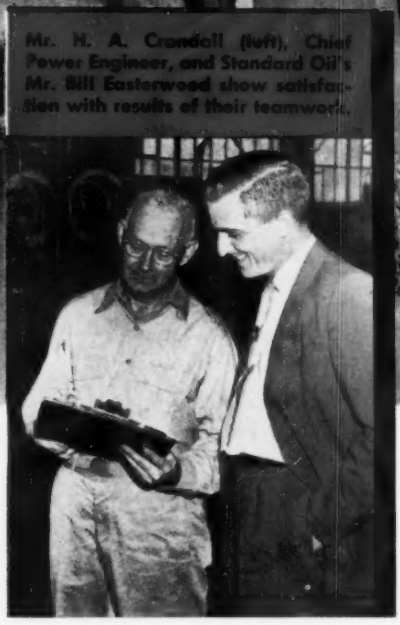
For the full story on Elliott Turbocharging contact your nearest Elliott representative or write Elliott Company, Supercharger Department, Jeannette, Pa.

ELLIOTT Company

M4-2

STEAM TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS CENTRIFUGAL COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS





Mr. H. A. Crandall (left), Chief Power Engineer, and Standard Oil's Mr. Bill Easterwood show satisfaction with results of their teamwork.

Here's a 27,000-hour record for low wear and clean operation!

● This diesel power plant serves a large midwest manufacturer of steel products.

The plant superintendent was increasingly aware that lubrication of his two diesels was not all that it should be. There was trouble with stuck rings, and crankcases showed excessive deposits. Working with a Standard Oil lubrication specialist, the superintendent switched his engines to STANDARD HD Oil.

During some 27,000 hours' operation of each unit, engines have remained exceptionally clean. Ring sticking troubles have been eliminated. Cylinders have shown less than 0.01" wear — a reduction of 50% over the previous, similar period. Neither of the original fills of STANDARD HD have needed to be replaced.

Midwest diesel operators are getting record efficiency and economy with the help of STANDARD HD. Your Standard Oil lubrication specialist can help you get similar results. Phone your local Standard Oil office. Or, write: Standard Oil Company, 910 South Michigan Ave., Chicago 80, Ill.

STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY

STANDARD (Indiana)